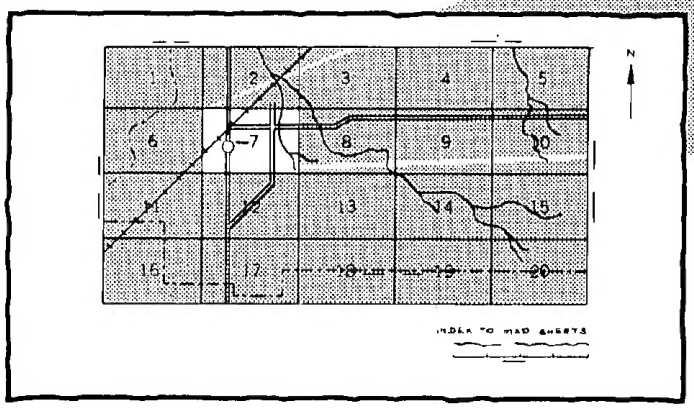
SOIL SURVEY OF

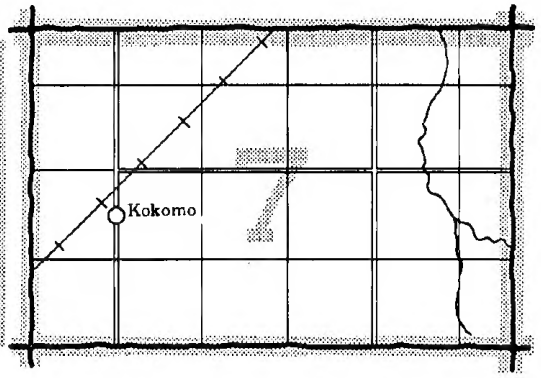
EL PASO COUNTY AREA, COLORADO

UNITED STATES DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE
IN COOPERATION WITH THE
COLORADO AGRICULTURAL EXPERIMENT STATION

HOW TO USE

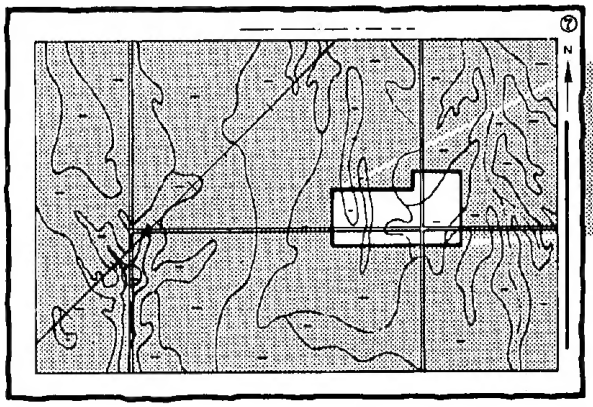
1. Locate your area of interest on the "Index to Map Sheets" (the last page of this publication).

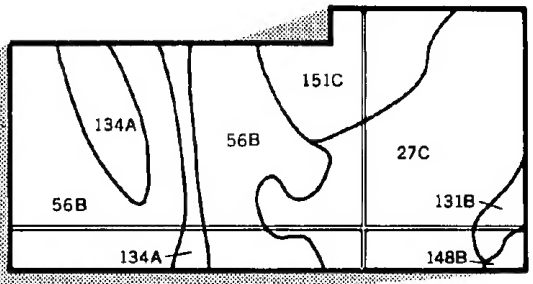




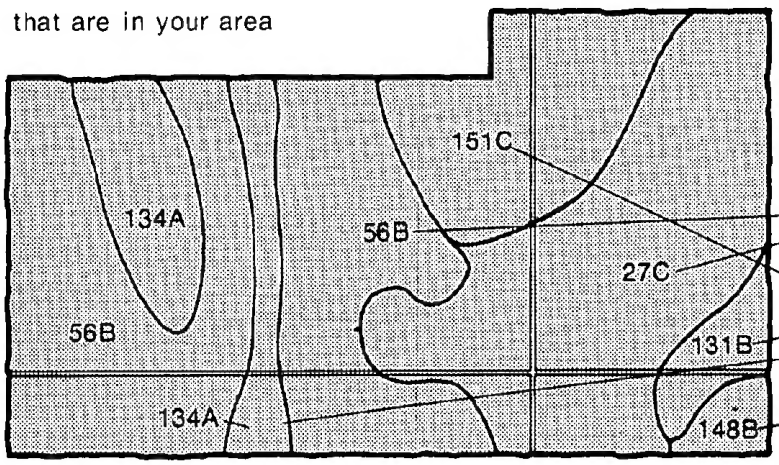
2. Note the number of the map sheet and turn to that sheet.

3. Locate your area of interest on the map sheet.





4. List the map unit symbols that are in your area

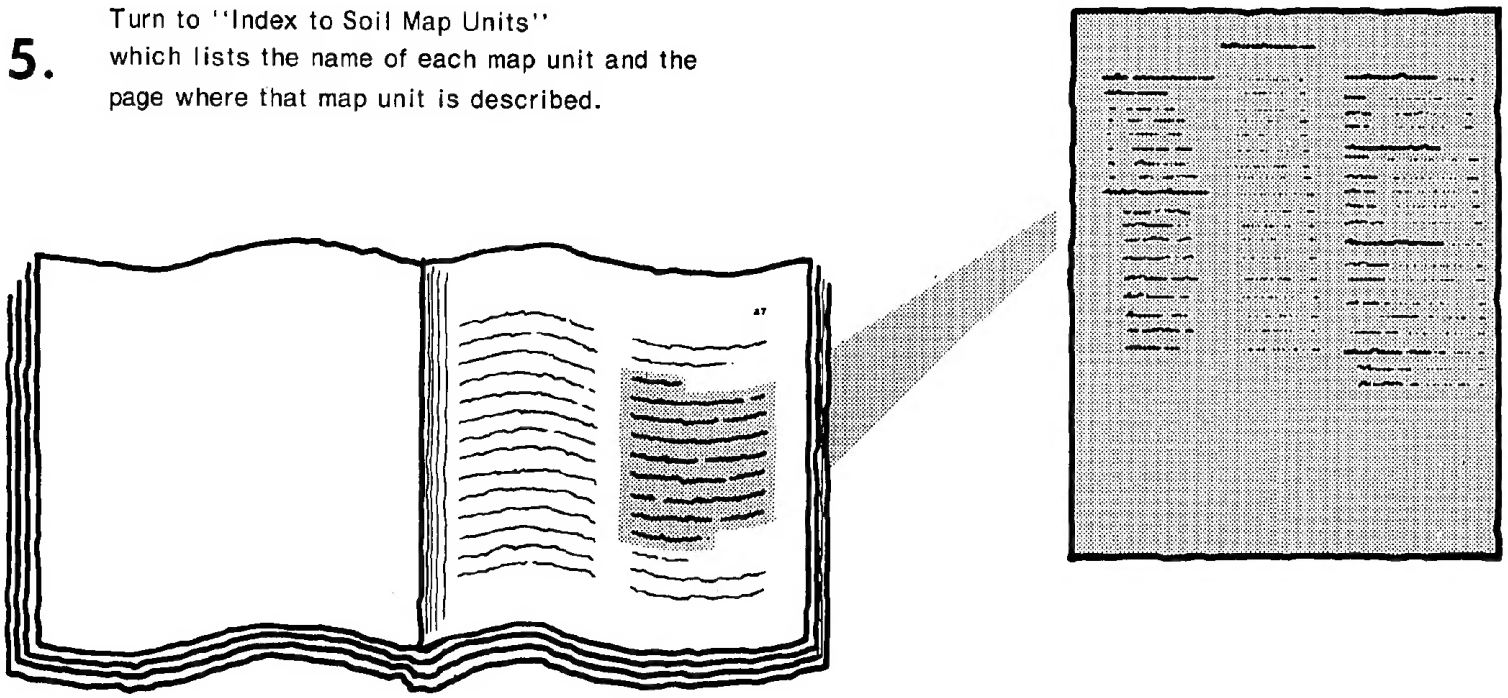


Symbols

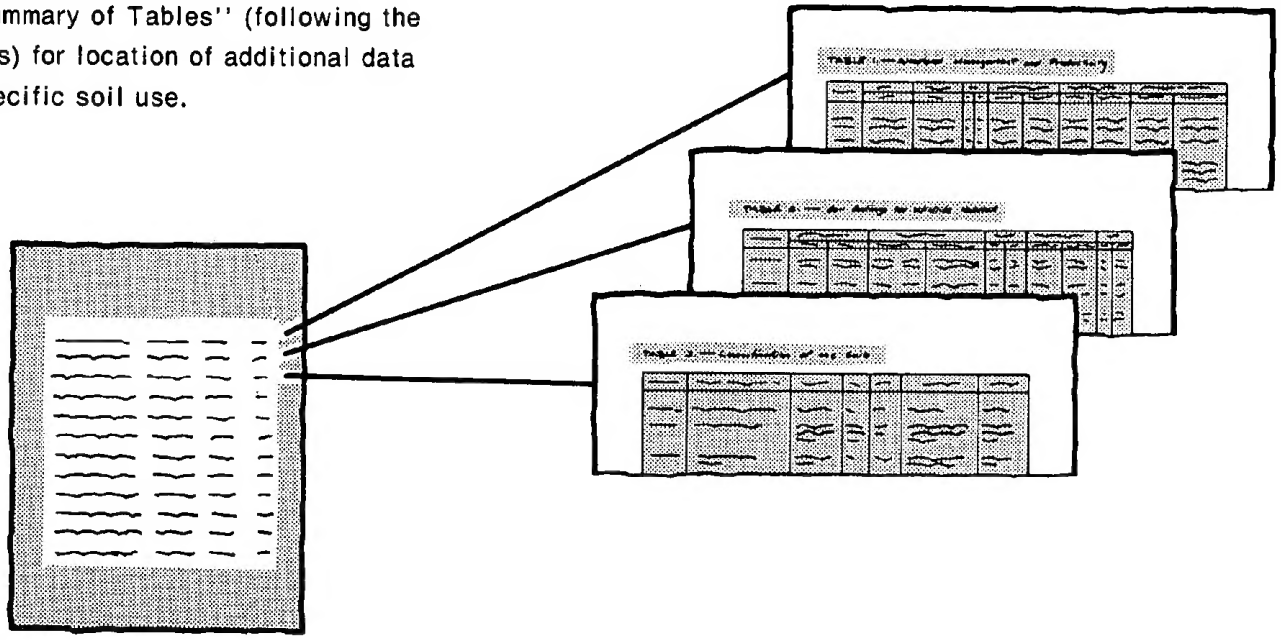
27C
56B
131B
134A
148B
151C

THIS SOIL SURVEY

5. Turn to "Index to Soil Map Units" which lists the name of each map unit and the page where that map unit is described.



6. See "Summary of Tables" (following the Contents) for location of additional data on a specific soil use.



7. Consult "Contents" for parts of the publication that will meet your specific needs. This survey contains useful information for farmers or ranchers, foresters or agronomists; for planners, community decision makers, engineers, developers, builders, or homebuyers; for conservationists, recreationists, teachers, or students; for specialists in wildlife management, waste disposal, or pollution control.

This is a publication of the National Cooperative Soil Survey, a joint effort of the United States Department of Agriculture and agencies of the States, usually the Agricultural Experiment Stations. In some surveys, other Federal and local agencies also contribute. The Soil Conservation Service has leadership for the Federal part of the National Cooperative Soil Survey. In line with Department of Agriculture policies, benefits of this program are available to all, regardless of race, color, national origin, sex, religion, marital status, or age.

Major fieldwork for this soil survey was completed in the period 1961-74. Soil names and descriptions were approved in 1975. Unless otherwise indicated, statements in the publication refer to conditions in the survey area in 1974. This survey was made cooperatively by the Soil Conservation Service and the Colorado Agricultural Experiment Station. It is part of the technical assistance furnished to the Black Squirrel, Central Colorado, Double El, Douglas County, Fountain Valley, Kiowa, and Turkey Creek Soil and Water Conservation Districts.

Soil maps in this survey may be copied without permission, but any enlargement of these maps can cause misunderstanding of the detail of mapping and result in erroneous interpretations. Enlarged maps do not show small areas of contrasting soils that could have been shown at a larger mapping scale.

Cover: Area of Connerton-Rock outcrop complex, 8 to 90 percent slopes, in foreground; Fortwingate-Rock outcrop complex, 15 to 60 percent slopes, at right center; and Kutler-Broadmoor-Rock outcrop complex, 25 to 90 percent slopes, in background. Pikes Peak in upper right corner.

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Issued June 1981

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Summary of Tables

Foreword

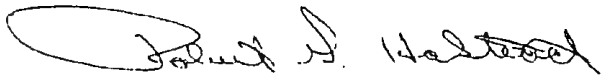
The Soil Survey of El Paso County Area, Colorado, contains much information useful in any land-planning program. Of prime importance are the predictions of soil behavior for selected land uses. Also highlighted are limitations or hazards to land uses that are inherent in the soil, improvements needed to overcome these limitations, and the impact that selected land uses will have on the environment.

This soil survey has been prepared for many different users. Farmers, ranchers, foresters, and agronomists can use it to determine the potential of the soil and the management practices required for food and fiber production. Planners, community officials, engineers, developers, builders, and homebuyers can use it to plan land use, select sites for construction, develop soil resources, or identify any special practices that may be needed to insure proper performance. Conservationists, teachers, students, and specialists in recreation, wildlife management, waste disposal, and pollution control can use the soil survey to help them understand, protect, and enhance the environment.

Great differences in soil properties can occur even within short distances. Soils may be seasonally wet or subject to flooding. They may be shallow to bedrock. They may be too unstable to be used as a foundation for buildings or roads. Very clayey or wet soils are poorly suited to septic tank absorption fields. A high water table makes a soil poorly suited to basements or underground installations.

These and many other soil properties that affect land use are described in this soil survey. Broad areas of soils are shown on the general soil map; the location of each kind of soil is shown on detailed soil maps. Each kind of soil in the survey area is described, and much information is given about each soil for specific uses. Additional information or assistance in using this publication can be obtained from the local office of the Soil Conservation Service or the Cooperative Extension Service.

This soil survey can be useful in the conservation, development, and productive use of soil, water, and other resources.



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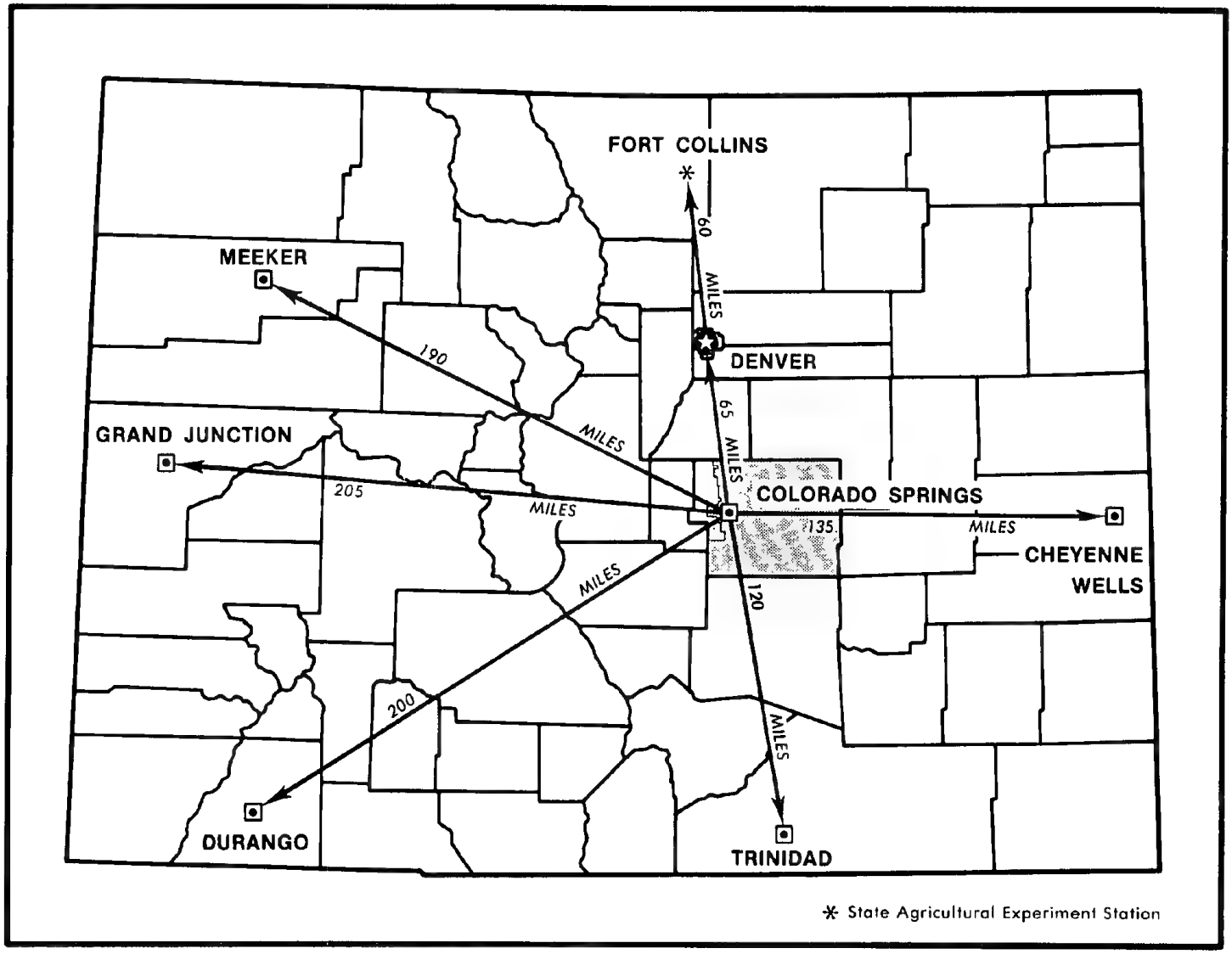
Soil Conservation Service



Location of El Paso County Area in Colorado.

SOIL SURVEY OF EL PASO COUNTY AREA, COLORADO

By Lynn S. Larsen, Soil Conservation Service

Fieldwork by Lynn S. Larsen, Jerry B. Harman, William S. Hawn, Eugene M. Ashford, and Stanley R. Albee, Soil Conservation Service

United States Department of Agriculture, Soil Conservation Service, in cooperation with the Colorado Agricultural Experiment Station

EL PASO COUNTY AREA is in the east-central part of Colorado (see facing page). It has an area of 1,255,840 acres, or 1,962 square miles. The Area includes all of El Paso County except the land in Pike National Forest, which is in the western part of the county. The population of the Area in 1975 was about 296,000. Colorado Springs, population 176,000, is the county seat.

The climate is generally mild and healthful, although winters are cold in the mountains. The average length of the growing season is 146 days.

The Area consists mostly of a level or somewhat broken plain in the eastern and southern parts and of mountains and foothills in the western and northwestern parts. The divide between the Arkansas and South Platte Rivers crosses the northern part of the county. Elevation ranges from 5,000 feet in the southeastern part to 14,110 feet at the summit of Pikes Peak.

The principal streams are Monument and Fountain Valley Creeks, which converge near Colorado Springs and then join the Arkansas River at Pueblo.

General nature of the Area

This section gives general information concerning the Area. It briefly discusses settlement, natural resources, climate, and farming.

Settlement

After the Louisiana Purchase in 1803, Thomas Jefferson sent explorers to this region, the first of whom was Zebulon Pike in 1806. His name has been immortalized in the Pikes Peak Region.

When news of the discovery of gold reached the East, people set out in prairie schooners to discover the "new El Dorado" and to share in its riches. By 1859 the first settlers poured into the so-called Kansas Territory. They named the first settlement, on Fountain Creek, El Paso City. By an act of Congress on February 18, 1859, the Colorado Territory was created. Abraham Lincoln appointed William Gilpin the first governor.

The construction of the Denver & Rio Grande Railway, completed in 1871, helped to develop the Area.

Colorado became a state in 1876, and El Paso County remained one of the original 17 counties formed by the territorial legislature in 1871. Population was only 986 in 1870, but it began to increase rapidly. By the end of the 1950's the population was 118,000. Today, about 296,000 people live in the county.

Natural resources

Soil is the most important natural resource in the survey area, and rangeland is probably the most important agricultural resource. The range is used primarily for cattle ranching. Several thousand acres of former rangeland in the foothills area has been subdivided into 5-acre homesites in recent years.

Water for livestock and domestic use is available in most of the survey area. Sources of water include surface runoff, underground aquifers in the Dawson and Laramie-Foxhill Formations, and ground water in alluvium associated with streams and watercourses. Wells in the Black Squirrel Creek Alluvium yield water for irrigation and municipal use. Diversion of streamflow from Fountain and Monument Creeks and their tributaries, together with wells drilled in terraces and bottom lands, also provide water for irrigation and municipal use.

Gravel and limestone for road construction and concrete aggregate are mined in the western part of the survey area.

Much of the northern half of the survey area is underlain by subbituminous coal. Coal mines were operated in the Colorado Springs area from 1882 to 1965. The area and extent of reserves having mining potential have not been estimated.

One of the few pure stands of ponderosa pine in Colorado is in the Black Forest area, which occupies about four townships northeast of Colorado Springs. Firewood, posts, and poles are among the main woodland products. The Black Forest area is rapidly being developed for rural homesites. The Black Forest is an im-

portant recharge area for the Dawson ground-water aquifer and the Black Squirrel Creek Alluvium.

Principal game animals in this survey area are mule deer, pronghorn antelope, cottontail rabbit, and scaled quail.

The overall capability of the soils in the survey area for crop production is poor compared with that of major producing areas in Colorado because of low rainfall, cool temperatures, and limited supplies of irrigation water.

Climate, scenery, and geographic location, taken together, are the main natural resources upon which the metropolitan area that includes the City of Colorado Springs has developed and is supported. The western boundary of the survey area is at the foot of Pikes Peak. People look upon this area as a desirable place to live, work, and play. Tourism, industry, residential growth, and military installations now consitute the major part of the area's economic base.

Climate

El Paso County Area is fairly hot in summer and rather cold in winter. Precipitation occurs mainly in the warm period during thunderstorms and occasional hailstorms. Snowstorms occur every winter, but blizzards are rare. Total annual precipitation is adequate for range grasses but marginal for dryland crops.

Table 1 shows temperature and precipitation data for the period 1951 to 1973. They were recorded at Colorado Springs but are representative of the entire Area. Table 2 shows the probable dates of the first freeze in fall and the last freeze in spring. Table 3 shows the length of the growing season.

In winter, the average temperature is 31.0 degrees F and the average daily minimum is 17.7 degrees. The absolute lowest temperature during the entire period of record was -27 degrees, observed at Colorado Springs on February 1, 1951. In summer, the average temperature is 68.4 degrees and the average daily maximum is 82.3 degrees. The absolute highest temperature was 100 degrees, recorded on June 23, 1954.

Growing degree days, shown in Table 1, are equivalent to "heat units." Starting in spring, they accumulate by the amount that the average temperature each day exceeds the base temperature. The normal monthly accumulation is used to schedule single or successive plantings of a crop within the seasonal limits of the last freeze in spring and the first freeze in fall.

As shown in Table 1, the total annual precipitation is about 15.21 inches. Of this total, 12.28 inches, or 81 percent, usually falls during the period April through September, which includes the growing season for most crops. Two years in 10, the April-September rainfall is less than 8.80 inches. The heaviest 1-day rainfall during the period of record was 3.00 inches at Colorado Springs on July 22, 1951. Thunderstorms number about 60 each year, 43 of which occur in summer.

Average seasonal snowfall is 42.2 inches. The greatest depth of snow on the ground at any one time during the period was 20 inches. On the average, 12 days have at least 1 inch of snow on the ground, but the number of days varies from year to year.

The average relative humidity in midafternoon in spring is less than 35 percent, and during the rest of the year it is about 41 percent. Humidity is higher at night in all seasons, and the average at dawn is about 63 percent. The percentage of possible sunshine is 72 in summer and 71 in winter. The prevailing direction of the wind is from the north-northeast. Average annual windspeed is 10.4 miles per hour. Average windspeed is highest, 12.2 miles per hour, in April.

The potential for dryland crops in El Paso County Area is limited by low average annual precipitation, which ranges from about 11 inches to about 19 inches. The southern half of the area and the part east of Fountain Creek have the lowest average annual precipitation, less than 13 inches. Cool temperatures and a short growing season, in areas in the northern part of the county that are at an elevation of more than about 6,800 feet, further limit the choice of crops.

Farming

The first farming in the survey area was in the Fountain Creek Valley in about 1860. Early settlers diverted water from the Creek and irrigated small fields on the bottom lands, growing corn and potatoes. Alfalfa later became the leading crop, as it is today.

By the 1870's about 35 irrigation ditches, diverting water from Fountain Creek, had been constructed. Available water was often insufficient for crop needs.

Between 1885 and 1910 a few ranchers practiced irrigation in the upper Black Squirrel Creek basin, growing native hay. Several irrigation wells were drilled in the basin between 1920 and 1940. Irrigation farming expanded rapidly, with drilling of additional irrigation wells commencing about 1950.

The most important irrigated crops in order of acreage are alfalfa, corn, pasture grasses, small grain, and bluegrass sod.

Nonirrigated, or dryland, farming began about 1900 and increased rapidly until 1920. Wheat, millet, and pinto beans were among the first crops grown and, with the addition of sorghums, are the main crops grown today.

Since 1950 many areas of cropland have been seeded to pasture and range grasses. The average farm includes more rangeland than cropland, and farming is generally a diversified operation. Production of livestock, mainly beef cattle, is a major enterprise on most farms.

Farm dairy herds were numerous during the period 1920-50. Dairying is now limited to a small number of specialized operations. There are also a few farm operators that specialize in production of feeder pigs and market hogs.

Farming potential is limited by a short growing season, a shortage of precipitation or irrigation water, and extreme seasonal variations in the amounts of precipitation received. Periods of severe drought occurred during the 1930's and 1950's. During these periods, crop and livestock production was low and most of the land in the survey area was damaged by soil blowing.

Seven soil conservation districts, in whole or in part, cover most of the survey area. Each district has developed a long-range conservation program, annually prepares a plan of operations, and currently provides technical assistance in the use and management of land to all landowners requesting such aid.

How this survey was made

Soil scientists made this survey to learn what kinds of soil are in the survey area, where they are, and how they can be used. The soil scientists went into the area knowing they likely would locate many soils they already knew something about and perhaps identify some they had never seen before. They observed the steepness, length, and shape of slopes; the size of streams and the general pattern of drainage; the kinds of native plants or crops; the kinds of rock; and many facts about the soils. They dug many holes to expose soil profiles. A profile is the sequence of natural layers, or horizons, in a soil; it extends from the surface down into the parent material, which has been changed very little by leaching or by the action of plant roots.

The soil scientists recorded the characteristics of the profiles they studied, and they compared those profiles with others in counties nearby and in places more distant. Thus, through correlation, they classified and named the soils according to nationwide, uniform procedures.

After a guide for classifying and naming the soils was worked out, the soil scientists drew the boundaries of the individual soils on aerial photographs. These photographs show woodlands, buildings, field borders, roads, and other details that help in drawing boundaries accurately. The soil map at the back of this publication was prepared from aerial photographs.

The areas shown on a soil map are called soil map units. Some map units are made up of one kind of soil, others are made up of two or more kinds of soil, and a few have little or no soil material at all. Map units are discussed in the sections "General soil map for broad land use planning" and "Soil maps for detailed planning."

While a soil survey is in progress, samples of soils are taken as needed for laboratory measurements and for engineering tests. The soils are field tested, and interpretations of their behavior are modified as necessary during the course of the survey. New interpretations are added to meet local needs, mainly through field observations of different kinds of soil in different uses under different levels of management. Also, data are assembled from other sources, such as test results, records, field experience, and information available from state and local specialists. For example, data on crop yields under defined practices are assembled from farm records and from field or plot experiments on the same kinds of soil.

But only part of a soil survey is done when the soils have been named, described, interpreted, and delineated on aerial photographs and when the laboratory data and other data have been assembled. The mass of detailed information then needs to be organized so that it is readily available to different groups of users, among them farmers, managers of rangeland and woodland, engineers, planners, developers and builders, homebuyers, and those seeking recreation.

General soil map for broad land use planning

The general soil map at the back of this publication shows, in color, the general map units described in this survey. Each map unit is a unique natural landscape that has a distinctive pattern of soils and relief and drainage. It normally consists of one or more soils of major extent and some soils of minor extent, and it is named for the major soils. The kinds of soils in one unit may occur in other units, but in a different pattern.

The map provides a broad perspective of the soils and landscapes in the survey area. It provides a basis for comparing the potential of large areas for general kinds of land use. From the map, areas that are generally suitable for certain kinds of farming or other land uses can be identified. Likewise, areas with soil properties that are distinctly unfavorable for certain land uses can be located.

Because of the small scale of the map, it does not show the kind of soil at a specific site. Thus, this is not a suitable map for planning the management of a farm or field or for selecting the exact location of a road or building or similar structure because the kinds of soil in any one soil association ordinarily differ from place to place in slope, depth, stoniness, drainage, or other characteristics that affect their management.

The general soil map at the back of this survey does not join, in all instances, with the general soil maps of adjacent counties. Differences in the maps have resulted from the differences in the occurrence of soil patterns and the recent advances in classification.

The map units in this survey have been grouped into three general kinds of landscapes for broad interpretive purposes. Each of the broad groups and the included map units in each group are described in the following pages.

Soils on cold, subhumid to semiarid mountains and foothills

The soils and Rock outcrop in this group are on fans, terraces, ridges, and side slopes of mountains and foothills at the higher elevations in the north-central and western parts of the survey area. The soils are nearly level to ex-

tremely steep. The average annual soil temperature is 45 to 47 degrees F, and the average annual precipitation is 15 to 20 inches.

The vegetation is mainly ponderosa pine and grasses in the north-central part of the area and ponderosa pine, Douglas-fir, white fir, and grasses in the western part.

The soils in the north-central part of the area are used mainly for grazing, nonirrigated cropland, homesites, and woodland. The soils in the western part are used mainly for limited grazing, homesites, recreation, wildlife habitat, and woodland.

Two map units are in this group. They make up about 12 percent of the survey area.

1. Coldcreek-Rock outcrop-Kutler

Rock outcrop and deep and moderately deep, strongly sloping to extremely steep, well drained and somewhat excessively drained soils that formed in material weathered from acid igneous rock

This map unit is in the foothill and mountain areas in the western part of the survey area. It makes up about 2 percent of the survey area. About 30 percent of the unit is Coldcreek soils, 30 percent is Rock outcrop, and 25 percent is Kutler soils. The remaining 15 percent is soils of minor extent.

Coldcreek soils have a cobbly loam surface layer, are deep and well drained, and have hard, fractured bedrock at a depth of more than 40 inches. Rock outcrop is Pikes Peak granite and mixed acid igneous rock. Kutler soils have a very gravelly sand loam surface layer, are moderately deep and somewhat excessively drained, and have highly weathered granite at a depth of 20 to 40 inches.

The soils of minor extent are the somewhat excessively drained Broadmoor soils, the well drained Tolman soils, and some areas of a stony sandy loam that has granite bedrock at a depth of 10 to 20 inches.

This unit is used for homesites, livestock grazing, recreation, wildlife habitat, and woodland.

2. Kettle-Pring-Peyton

Deep, nearly level to steep, well drained soils that formed in material weathered from arkosic sedimentary rock

This map unit is in the cooler north-central and northwestern parts of the survey area. It makes up about 10 percent of the survey area. About 30 percent of the unit is Kettle soils, 30 percent is Pring soils, and 15 percent is Peyton soils. The remaining 25 percent is soils of minor extent.

The Kettle soils have a gravelly loamy sand surface layer, the Pring soils have a coarse sandy loam surface layer, and the Peyton soils have a sandy loam surface layer.

The soils of minor extent are the well drained Brussett, Crowfoot, Cruckton, Elbeth, Holderness, Jarre, and Tomah soils.

This unit is used for dryland farming, homesites, livestock grazing, wildlife habitat, and woodland. The Kettle and Elbeth soils are used mostly for woodland and a limited amount of livestock grazing. Most of the homesites in this unit are on these two soils, but all of the soils in the unit are used for homesites. Most areas of the Pring soils are used for livestock grazing. Farming is mostly on the Peyton and Brussett soils. Choice of crops is limited by the short growing season.

Soils on mild, semiarid foothills and plains

The soils in this group are on fans, terraces, ridges, and side slopes, mainly in the central and northeastern parts of the survey area. A smaller area is in the southwestern part. The soils are nearly level to extremely steep. The average annual soil temperature is 47 to 49 degrees F, and the average annual precipitation is 13 to 17 inches.

The vegetation is mainly grass, but some ponderosa pine, pinyon pine, and juniper occur in the western and southwestern parts of the area.

These soils are used mainly for grazing, cropland, wildlife habitat, and urban development.

Four map units are in this group. They make up about 49 percent of the survey area.

3. Columbine-Stapleton

Deep, nearly level to strongly sloping, well drained, gravelly soils that formed in sandy alluvium derived from arkosic sedimentary rock

This map unit is in the north-central part of the survey area. It makes up about 2 percent of the area. About 50 percent of the unit is Columbine soils, and 30 percent is Stapleton soils. The remaining 20 percent is soils of minor extent.

The Columbine soils have a gravelly sandy loam surface layer and are nearly level to gently sloping. They contain more gravel than the Stapleton soils. The Stapleton soils have a sandy loam surface layer and are gently sloping to strongly sloping.

The soils of minor extent are the somewhat excessively drained Blakeland and Ellicott soils; the well drained Blendon, Louviers, and Truckton soils; and some areas of Ustic Torrifluvents, loamy, and Fluvaquentic Haplaquolls, nearly level.

Most of this unit is in native grass and is used for grazing livestock. It is also used for homesites and wildlife habitat.

4. Truckton-Blakeland-Bresser

Deep, nearly level to moderately steep, sandy soils that formed in material weathered from arkosic sedimentary rock

This unit extends from the Colorado Springs area to the eastern and northeastern parts of the survey area. It makes up about 41 percent of the survey area. About 35

percent of the association is Truckton soils, 25 percent is Blakeland soils, and 20 percent is Bresser soils. The remaining 20 percent is soils of minor extent.

The Truckton and Bresser soils have a sandy loam surface layer. The Truckton soils have a sandy loam subsoil, and the Bresser soils have a sandy clay loam subsoil. The Blakeland soils have a loamy sand surface layer that grades to a sand substratum.

The soils of minor extent are the well drained Ascalon, Blendon, Columbine, Louviers, Stapleton, and Yoder soils.

This unit is used mainly for grazing livestock. Cultivated areas are mostly in the central and eastern parts of the unit. Dryland farming is most common, but some irrigation, mostly in the Ellicott area, is used. The circular sprinkler type of irrigation is the method most commonly used. Several subdivisions have been developed in the past 5 years in the western and central parts of the unit. This unit is also used for wildlife habitat.

5. Cushman-Bresser

Moderately deep and deep, nearly level to strongly sloping soils that formed in material derived from interbedded sandstone and shale and from arkosic sedimentary rock

This map unit is in the northeastern part of the survey area. It makes up about 3 percent of the area. About 35 percent of the unit is Cushman soils, and 35 percent is Bresser soils. The remaining 30 percent is soils of minor extent.

The Cushman soils have a loam surface layer and are underlain by interbedded sandstone and shale at a moderate depth. The Bresser soils have a sandy loam surface layer and are deep.

The soils of minor extent are the well drained Kutch, Louviers, Nunn, Razor, and Truckton soils.

About 65 percent of this unit is used for livestock grazing and wildlife habitat. The remaining 35 percent is used for dryland farming.

6. Neville-Nederland-Rizozo

Deep and shallow, gently sloping to moderately steep, well drained soils that formed in alluvium and residuum derived from red sandstone and in cobbly and gravelly alluvium

This map unit is in the southwestern part of the survey area. It makes up about 3 percent of the area. About 25 percent of the unit is Neville soils, 15 percent is Nederland soils, and 10 percent is Rizozo soils. The remaining 50 percent is soils of minor extent.

The Neville soils are deep and have a fine sandy loam surface layer. The Nederland soils are deep, are well drained, and have a cobbly sandy loam surface layer and a high content of gravel and cobbles. The Rizozo soils are shallow and have a loam surface layer.

The soils of minor extent are the well drained Penrose, Rednun, Manvel, Satanta, Stroupe, and Travessilla soils.

Most of this unit is used for grazing livestock, wildlife habitat, woodland, and military maneuvers. About 85 percent of the unit is in pinyon pine and juniper. There is only a very small acreage of cropland, because precipitation is limited.

Soils on mild, semiarid to arid plains

The soils in this group are on fans, terraces, hills, ridges, and side slopes throughout the southern half of the survey area. The soils are nearly level to steep. The average annual soil temperature is 48 to 51 degrees F, and the average annual precipitation is 11 to 13 inches.

The vegetation is mainly grass. Cottonwood trees and willows occur along Fountain Creek.

The soils in this group are used mainly for grazing, but some areas are used for nonirrigated and sprinkler irrigated cropland. A few areas in the western part of the area are used for urban development and for military reservations.

Seven units are in this group. They make up about 39 percent of the survey area.

7. Schamber-Razor

Deep and moderately deep, gently rolling to steep, well drained soils that formed in material weathered from gravelly alluvium and in residuum derived from shale

This unit is in narrow bands extending from Colorado Springs south to the Pueblo County line, mostly on the west side of Fountain Creek. It makes up about 1 percent of the survey area. About 40 percent of the unit is Schamber soils, and 30 percent is Razor soils. The remaining 30 percent is soils of minor extent.

The Schamber soils are generally in higher positions on the landscape than the Razor soils. The Schamber soils are deep and have a gravelly loam surface layer. The Razor soils are moderately deep and have a clay loam surface layer.

The soils of minor extent are the somewhat excessively drained Chaseville soils and the well drained Heldt, Kim, and Midway soils.

This unit is used for grazing livestock, for wildlife habitat, for military maneuvers, and as impact areas. It is also a source of gravel. The potential for homesites and wildlife habitat is poor.

8. Razor-Midway

Moderately deep and shallow, gently sloping to moderately steep, well drained soils that formed in material derived from calcareous shale

This unit is in the central and southwestern parts of the survey area. It makes up about 9 percent of the area. About 30 percent of the unit is Razor soils, and 25 percent is Midway soils. The remaining 45 percent is soils of minor extent.

Razor soils are moderately deep and have a clay loam surface layer. Midway soils are shallow and also have a clay loam surface layer.

The soils of minor extent are the well drained Kim, Manzanola, Nelson, Tassel, and Wiley soils. Southeast of the town of Fountain are numerous cone-shaped geological formations referred to locally as tepee buttes. The tepee buttes consist of scattered piles of marine rubble that rises above the more nearly level plains.

This unit is used mostly for livestock grazing. It is also used for wildlife habitat and for military purposes. Cultivation is limited because of low precipitation.

This unit has fair potential for homesites and for rangeland wildlife habitat.

9. Manzanola-Limon

Deep, nearly level to gently sloping, well drained soils that formed in calcareous alluvium

This map unit is on low terraces and fans along Fountain Creek, south of Colorado Springs, and along Jimmy Camp Creek. It makes up about 2 percent of the survey area. About 40 percent of the unit is Manzanola soils, and 35 percent is Limon soils. The remaining 25 percent is soils of minor extent.

Manzanola soils have a clay loam surface layer. Limon soils have a clay surface layer.

The soils of minor extent in this unit are the somewhat excessively drained Ellicott soils; the moderately well drained Heldt soils; the well drained Nunn soils; and Ustic Torrifluvents, loamy.

A large part of this unit is used as irrigated cropland and pasture. Use for wildlife habitat, especially along the water areas, is also important. The association is also used for livestock grazing and homesites.

This map unit has good potential for homesites. It has fair potential for wildlife habitat.

10. Stoneham-Ascalon-Fort Collins

Deep, nearly level to strongly sloping, well drained soils that formed in mixed alluvial and eolian material

This unit is on uplands in the south-central part of the survey area. It makes up about 5 percent of the survey area. About 25 percent of the unit is Stoneham soils, 20 percent is Ascalon soils, and 20 percent is Fort Collins soils. The remaining 35 percent is soils of minor extent.

Stoneham and Ascalon soils have a sandy loam surface layer. Fort Collins soils have a loam surface layer.

The soils of minor extent are the well drained Keith, Olney, Vona, and Wiley soils.

This unit is used mainly for livestock grazing. It is very limited for use as cropland because of low precipitation. It has good potential for homesites and fair potential for wildlife habitat.

11. Bijou-Wigton

Deep, nearly level to moderately sloping, well drained and excessively drained soils that formed in noncalcareous, sandy alluvial and eolian material

This map unit is in the south-central part of the survey area. It makes up about 3 percent of the survey area. About 60 percent of the association is Bijou soils, and 15 percent is Wigton soils. The remaining 25 percent is soils of minor extent.

Bijou soils have a loamy sand and sandy loam surface layer and a sandy loam subsoil. Wigton soils have a loamy sand surface layer and loamy sand and sand underlying material.

The soils of minor extent in this unit are the well drained Ascalon, Olney, and Vona soils, the excessively drained Valent soils, and the somewhat excessively drained Ellicott soils.

Most of this unit is used for livestock grazing. Some cropland, both dryland and irrigated, is scattered throughout the area. Irrigation is done by use of the circular sprinkler type of system.

This unit has good potential for homesites. It has fair potential for wildlife habitat.

12. Valent-Wigton

Deep, nearly level to hilly, excessively drained soils that formed in sandy eolian material

This map unit is in the south-central and southeastern parts of the survey area. It makes up about 7 percent of the area. About 60 percent of the unit is Valent soils, and 15 percent is Wigton soils. The remaining 25 percent is soils of minor extent.

Valent soils have a sand surface layer, Wigton soils have a loamy sand surface layer.

The soils of minor extent in this unit are the well drained Ascalon, Bijou, Olney, and Vona soils.

Almost all of this unit is used for livestock grazing. These soils are unsuited to dryland farming because of the sandy texture and limited precipitation. Sprinkler irrigation is used in a few small areas.

The potential for homesites is good. The limiting features are the sandy texture and the hazard of erosion. The potential for wildlife habitat is fair.

13. Olney-Vona

Deep, nearly level to moderately sloping, well drained soils that formed in calcareous sandy sediment

This map unit is in the southeastern part of the survey area. It makes up about 12 percent of the area. About 40 percent of the unit is Olney soils, and 25 percent is Vona soils. The remaining 35 percent is soils of minor extent.

Olney and Vona soils have a sandy loam surface layer.

The soils of minor extent are the well drained Ascalon and Bijou soils and the excessively drained Valent and Wigton soils.

Most of this unit is used for grazing livestock. About 10 percent, mostly areas of Olney soils, is dryland farmed. A larger percentage was farmed in the past, but many fields have been abandoned or reseeded to grass because of low precipitation and the hazard of soil blowing.

The potential for homesites is good, and the potential for wildlife habitat is fair.

Broad land use considerations

Deciding which land should be used for urban development is becoming increasingly important in the survey area. Each year a considerable amount of land is being developed for urban uses. This land is mainly in the western part of the survey area, especially in the Colorado Springs area. About 110,000 acres, or nearly 8 percent of the survey area, is urban or built-up land. Several different kinds of soil occur in this rapidly urbanizing part of the survey area. Certain soils are more suitable for urban uses than others. Some soils may cause severe problems for builders and homeowners. In general, the soils in the survey area that have good potential for cultivated crops also have good potential for urban development. The data about specific soils in this survey can be helpful in planning more detailed land use patterns.

Areas where the soil features are so unfavorable that the cost of urban development is prohibitive are not extensive in the survey area. However, most of the Coldcreek-Rock outcrop-Kutler map unit has limitations because of steep slopes, rock outcrop, and depth to bedrock. Regardless of these limitations, these and similar soils are very popular as building sites because of their esthetic value. Also, the soils in the Razor-Midway unit are limited by depth to shale. Parts of the Cushman-Bresser unit have sandstone or shale at a depth of 20 to 40 inches. The Manzanola-Limon unit has soils that have high shrink-swell potential. Much of the Neville-Nederland-Rizozo unit has steep slopes, rock outcrop, and bedrock at a depth of 10 to 40 inches.

In large areas of the survey area are soils that can be developed for urban uses at lower cost than can the soils in the units named above. These areas include most parts of the other units.

The eastern part of the Truckton-Blakeland-Bresser unit has the best potential for dryfarming, and some irrigated farming is practiced in the Ellicott area. Irrigated farming is also practiced in the Manzanola-Limon unit. Farming in the northern part of the Kettle-Pring-Peyton unit is limited in the choice of crops because of cool temperatures and a short growing season. The Stoneham-Ascalon-Fort Collins, Bijou-Wigton, and Olney-Vona units have potentially good soils for farming, but farming is limited by low average annual precipitation and lack of irrigation water.

Parts of the Kettle-Pring-Peyton unit and the Coldcreek-Rock outcrop-Kutler unit are used as woodland. The main woodland products are firewood, posts, and poles. These units have undergone rapid development for homesites.

The Columbine-Stapleton unit is mainly rangeland, but some subdivision development has taken place. Parts of the unit are subject to flooding and have severe limitations for homesites. Almost all of the Valent-Wigton unit is rangeland. It is not suitable for crops, because the soils are droughty and precipitation is low. The Schamber-Razor unit is also used mostly as rangeland, but some areas are used as a source of gravel.

Soil maps for detailed planning

The map units shown on the detailed soil maps at the back of this publication represent the kinds of soil in the survey area. They are described in this section. The descriptions together with the soil maps can be useful in determining the potential of a soil and in managing it for food and fiber production; in planning land use and developing soil resources; and in enhancing, protecting, and preserving the environment. More information for each map unit, or soil, is given in the section "Use and management of the soils."

Preceding the name of each map unit is the symbol that identifies the soil on the detailed soil maps. Each soil description includes general facts about the soil and a brief description of the soil profile. In each description, the principal hazards and limitations are indicated, and the management concerns and practices needed are discussed.

The map units on the detailed soil maps represent an area on the landscape made up mostly of the soil or soils for which the unit is named. Most of the delineations shown on the detailed soil map are phases of soil series.

Soils that have a similar profile make up a *soil series.* Except for allowable differences in texture of the surface layer or of the underlying substratum, all the soils of a series have major horizons that are similar in composition, thickness, and arrangement in the profile. A soil series commonly is named for a town or geographic feature near the place where a soil of that series was first observed and mapped.

Soils of one series can differ in texture of the surface layer or in the underlying substratum and in slope, erosion, stoniness, salinity, wetness, or other characteristics that affect their use. On the basis of such differences, a soil series is divided into phases. The name of a *soil phase* commonly indicates a feature that affects use or management. For example, Terry sandy loam, 1 to 8 percent slopes, is one of several phases within the Terry series.

Some map units are made up of two or more dominant kinds of soil. Such map units are called soil complexes, soil associations, and undifferentiated groups.

A *soil complex* consists of areas of two or more soils that are so intricately mixed or so small in size that they cannot be shown separately on the soil map. Each area in-

cludes some of each of the two or more dominant soils, and the pattern and proportion are somewhat similar in all areas. Elbeth-Pring complex, 5 to 30 percent slopes, is an example.

An *undifferentiated group* is made up of two or more soils that could be mapped individually but are mapped as one unit because there is little value in separating them. The pattern and proportion of the soils are not uniform. An area shown on the map has at least one of the dominant (named) soils or may have all of them. Olney and Vona soils, eroded, is an undifferentiated group in this survey area.

Most map units include small, scattered areas of soils other than those that appear in the name of the map unit. Some of these soils have properties that differ substantially from those of the dominant soil or soils and thus could significantly affect use and management of the map unit. These soils are described in the description of each map unit. Some of the more unusual or strongly contrasting soils that are included are identified by a special symbol on the soil map.

Most mapped areas include places that have little or no soil material and support little or no vegetation. Such places are called *miscellaneous areas*; they are delineated on the soil map and given descriptive names. Pits, gravel is an example. Some of these areas are too small to be delineated and are identified by a special symbol on the soil map.

The military impact area described in some map units consists of a large area on the Fort Carson Military Reservation. It is used as an artillery and bombing target area. This area has not been surveyed, but most of the soils mapped adjacent to the area are in the Heldt, Kim, Midway, Razor, and Wiley series. It is estimated that most of the impact area is Razor-Midway complex.

The acreage and proportionate extent of each map unit are given in table 4, and additional information on properties, limitations, capabilities, and potentials for many soil uses is given for each kind of soil in other tables in this survey. (See "Summary of tables.") Many of the terms used in describing soils are defined in the Glossary.

Soil descriptions

1—Alamosa loam, 1 to 3 percent slopes. This deep, poorly drained soil formed in alluvium on flood plains and fans. Elevation ranges from 7,200 to 7,700 feet. The average annual precipitation is about 18 inches, the average annual air temperature is about 42 degrees F, and the average frost-free period is about 120 days.

Typically, the surface layer is dark gray loam about 6 inches thick. The subsoil is clay loam about 27 inches thick; it is very dark gray in the upper part and gray in the lower part. The substratum is dark greenish gray and light gray sandy clay loam and sandy loam. Mottles are common in the subsoil and substratum.

Included with this soil in mapping are small areas of Ellicott loamy coarse sand, 0 to 5 percent slopes; Cruckton sandy loam, 1 to 9 percent slopes; Peyton sandy loam, 1 to 5 percent slopes; and Pring coarse sandy loam, 3 to 8 percent slopes.

Permeability of this Alamosa soil is moderately slow. Effective rooting depth is 60 inches or more. Available water capacity is high. Organic matter content of the surface layer is high. This soil has a high water table, usually between May and October. Surface runoff is slow, and the hazard of erosion is slight.

This soil is used mostly for native hay or pasture.

The potential plant community is mainly slender wheatgrass, Baltic rush, Nebraska sedge, timothy, and reedgrassses. Willows are a part of the plant community.

If the range has deteriorated, it consists mostly of Kentucky bluegrass and willows. If overgrazing is severe, denuding of the soil and gullying are possible and reestablishment of a good plant cover is very difficult. Where seeding is practical, smooth brome, orchardgrass, Garrison creeping foxtail, or reed canarygrass should be used.

Wet areas of this soil are well suited to shallow water developments, which encourage wetland wildlife such as waterfowl and a number of shore birds. Because of the availability of moisture, this soil provides excellent waterfowl nesting cover. Rangeland wildlife, such as deer and cottontail, use the areas where excellent cover is provided by willows, rushes, and other wetland vegetation. Wildlife on this soil can best be aided by using proper livestock grazing practices and allowing natural vegetation, such as willows and cattails, to grow.

This soil has poor potential for homesites. The main limitations for this use are a high water table and the hazard of flooding. Capability subclass Vw.

2—Ascalon sandy loam, 1 to 3 percent slopes. This deep, well drained soil formed in mixed alluvium and wind-laid material on uplands. Elevation ranges from 5,500 to 6,500 feet. The average annual precipitation is about 15 inches, the average annual air temperature is about 48 degrees F, and the average frost-free period is about 140 days.

Typically, the surface layer is brown sandy loam about 8 inches thick. The subsoil is brown, yellowish brown, and pale brown sandy clay loam about 22 inches thick. The substratum is calcareous, very pale brown sandy loam and loamy sand.

Included with this soil in mapping are small areas of Bresser sandy loam, 0 to 3 percent slopes; Olney sandy loam, 0 to 3 percent slopes; Vona sandy loam, 1 to 3 percent slopes; and Fort Collins loam, 0 to 3 percent slopes.

Permeability of this Ascalon soil is moderate. Effective rooting depth is 60 inches or more. Available water capacity is moderate. Organic matter content of the surface layer is medium. Surface runoff is slow, and the hazards of erosion and soil blowing are moderate.

This soil is used mainly as cropland.

A typical rotation is wheat and summer fallow. Summer fallow is necessary because rainfall is insufficient for yearly cropping. Feed grains such as millet are used as a

partial or total substitute for wheat. Crop residue management, stripcropping, and minimum tillage are needed to control soil blowing.

Native vegetation is dominantly blue grama, needleandthread, side-oats grama, sand dropseed, and buckwheat. Western wheatgrass, junegrass, and mountain muhly are also present, mainly where this soil occurs in the northern part of the survey area.

Seeding is a suitable practice if the range has deteriorated. Seeding the native grasses is a good practice. If the range is severely eroded and blowouts have developed, fertilizing the new seeding is a good practice. Brush control and grazing management may be needed to improve the depleted range. Grazing should be managed so that enough forage is left standing to protect the soil from blowing, to increase infiltration of water, and to catch and hold snow.

This soil is generally suited to windbreaks and environmental plantings. Soil blowing is the main limitation to the establishment of trees and shrubs. This limitation can be overcome by cultivating only in the tree rows and leaving a strip of vegetation between the rows. Supplemental irrigation may be needed when planting and during dry periods. Trees that are best suited and have good survival are Rocky Mountain juniper, eastern redcedar, ponderosa pine, Siberian elm, Russian-olive, and hackberry. Shrubs that are best suited are skunkbush sumac, lilac, and Siberian peashrub.

This soil is suited to wildlife habitat. It is best suited to habitat for openland and rangeland wildlife. In cropland areas, habitat favorable for ring-necked pheasant, mourning dove, and many nongame species can be developed by establishing areas for nesting and escape cover. For pheasant, the provision of undisturbed nesting cover is vital and should be included in plans for habitat development. This is especially true in areas of intensive farming. Rangeland wildlife, such as pronghorn antelope, can be encouraged by developing livestock watering facilities, properly managing livestock grazing, and reseeding range where needed.

This soil has good potential for use as homesites. Its main limitation for this use is moderate shrink-swell potential. Special designs for buildings and roads are needed to overcome this limitation. Capability subclasses IVe, nonirrigated, and IIIe, irrigated.

3—Ascalon sandy loam, 3 to 9 percent slopes. This deep, well drained soil formed in mixed alluvium and wind-laid materials on uplands. Elevation ranges from 5,500 to 6,500 feet. The average annual precipitation is about 15 inches, the average annual air temperature is about 48 degrees F, and the average frost-free period is about 140 days.

Typically, the surface layer is brown sandy loam about 8 inches thick. The subsoil is brown, yellowish brown, and pale brown sandy clay loam about 22 inches thick. The substratum is calcareous, very pale brown sandy loam and loamy sand.

Included with this soil in mapping are small areas of Bresser sandy loam, 3 to 5 percent slopes; Olney sandy loam, 3 to 5 percent slopes; Vona sandy loam, 3 to 9 percent slopes; and Fort Collins loam, 3 to 8 percent slopes.

Permeability of this Ascalon soil is moderate. Effective rooting depth is 60 inches or more. Available water capacity is moderate. Organic matter content of the surface layer is medium. Surface runoff is slow to medium, and the hazards of erosion and soil blowing are moderate.

Most areas of this soil are used as range, but some areas on the more gentle slopes are cultivated. Wheat is the main crop, but some sorghum is also grown.

Native vegetation is dominantly blue grama, needleandthread, side-oats grama, sand dropseed, and buckwheat. Western wheatgrass, junegrass, and mountain muhly are also present, predominantly where this soil occurs in the northern part of the survey area.

Seeding is a good practice if the range has deteriorated. Native grasses should be used. If the range is severely eroded and blowouts have developed, fertilizing the new seeding is a good practice. Brush control and grazing management may be needed to improve the depleted range. Grazing of animals should be managed so that enough forage is left standing to protect the soil from blowing, to increase infiltration of water, and to catch and hold snow.

Windbreaks and environmental plantings are generally suited to this soil. Soil blowing is the principal limitation to the establishment of trees and shrubs. This limitation can be overcome by cultivating only in the tree rows and leaving a strip of vegetation between the rows. Supplemental irrigation may be necessary at the time of planting and during dry periods. Trees that are best suited and have good survival are Rocky Mountain juniper, eastern redcedar, ponderosa pine, Siberian elm, Russian-olive, and hackberry. Shrubs that are best suited are skunkbush sumac, lilac, and Siberian peashrub.

This soil is suited to wildlife habitat. It is best suited to habitat for openland and rangeland wildlife. In cropland areas, habitat favorable for ring-necked pheasant, mourning dove, and many nongame species can be developed by establishing areas for nesting and escape cover. For pheasant, undisturbed nesting cover is vital and should be provided for in plans for habitat development. Rangeland wildlife, such as pronghorn antelope, can be encouraged by developing livestock watering facilities, properly managing livestock grazing, and reseeding range where needed.

This soil has good potential for use as homesites. Its main limitation for foundations, roads, and streets is moderate shrink-swell potential. Special design of roads is also necessary because of potential frost action. Capability subclasses IVe, nonirrigated, and IIIe, irrigated.

4—Badland. Badland occupies steep, rough, eroding areas. Slopes range from 0 to more than 100 percent. Depending on the location, Badland formed from material derived from shale, sandstone, siltstone, and gold ore mill tailings. Areas of Badland are in the vicinity of the town

of Calhan; the Corral Bluffs, east of Colorado Springs; the southwestern part of the survey area on Fort Carson; and the old Golden Cycle gold ore processing mill in the western part of Colorado Springs.

Runoff is very rapid, and the hazard of erosion is high. The reaction of the tailings material is slightly acid to extremely acid. Little or no soil development has taken place. Gullying is severe in most areas of Badland.

Vegetation grows only in small patches of soil material in drainageways and in some of the less eroded areas. The sloping part of Badland is extremely gullied and lacks vegetation.

Most areas of Badland are used for wildlife habitat. In the mill tailings area in the western part of Colorado Springs, some urban development has taken place in level areas that have had a layer of topsoil applied to the surface. Capability subclass VIIIs.

5—Bijou loamy sand, 1 to 8 percent slopes. This deep, somewhat excessively drained soil is on flood plains, terraces, and uplands. It formed in sandy alluvium and eolian material derived from arkose deposits. Elevation ranges from 5,400 to 6,200 feet. The average annual precipitation is about 13 inches, the average annual air temperature is about 49 degrees F, and the average frost-free period is about 145 days.

Typically, the surface layer is brown loamy sand 8 inches thick. The subsoil is grayish brown sandy loam about 20 inches thick. The substratum is pale brown loamy coarse sand.

Included with this soil in mapping are small areas of Olney sandy loam, 3 to 5 percent slopes; Valent sand, 1 to 9 percent slopes; Vona sandy loam, 3 to 9 percent slopes, and Wigton loamy sand, 1 to 8 percent slopes.

Permeability of this Bijou soil is rapid. Effective rooting depth is 60 inches or more. Available water capacity is moderate. Organic matter content of the surface layer is low. Surface runoff is slow, and the hazards of erosion and soil blowing are severe.

Most areas of this soil are used for range. A small acreage is used for crops grown under sprinkler irrigation.

This soil is not suited to dryfarming, because of the soil blowing hazard. Corn, pasture, and alfalfa are the principal crops grown under irrigation. Corn and pasture require moderate to heavy applications of nitrogen. Alfalfa generally responds to phosphate fertilizer. Some zinc deficiency has been noted on corn. Crop residue management must be used at all times to control soil blowing. Crops that produce little or no residue are not suited to this soil.

Native vegetation is mainly sandreed, sand bluestem, blue grama, and needleandthread. Sand sagebrush makes up only a small part of the total ground cover.

In overgrazed areas mechanical and chemical sagebrush control may be needed. This soil is highly susceptible to soil blowing, and water erosion occurs when the plant cover is inadequate. Interseeding should be used in overgrazed areas. Proper location of livestock watering facilities helps to control grazing.

Windbreaks and environmental plantings are fairly well suited to this soil. Blowing sand and low available water capacity are the principal limitations to the establishment of trees and shrubs. The soil is so loose that trees need to be planted in shallow furrows and plant cover needs to be maintained betweeen the rows. Supplemental irrigation may be needed to insure survival. Trees that are best suited and have good survival are Rocky Mountain juniper, eastern redcedar, ponderosa pine, and Siberian elm. Shrubs that are best suited are skunkbush sumac, lilac, and Siberian peashrub.

This soil is suited to wildlife habitat. It is best suited to habitat for openland and rangeland wildlife. Rangeland wildlife, such as pronghorn antelope, can be encouraged by developing livestock watering facilities, properly managing livestock grazing, and reseeding range where needed.

This soil has good potential for homesites. Shallow excavation is severely limited because cut banks cave in. This soil requires special management practices to reduce water erosion and soil blowing because it is sandy. Capability subclasses VIe, nonirrigated, and IVe, irrigated.

6—Bijou sandy loam, 1 to 3 percent slopes. This deep, well drained soil is on flood plains, terraces, and uplands. It formed in sandy alluvium and in eolian material derived from arkose deposits. Elevation ranges from 5,400 to 6,200 feet. The average annual precipitation is about 13 inches, the average annual air temperature is about 49 degrees F, and the average frost-free period is about 145 days.

Typically, the surface layer is brown sandy loam about 4 inches thick. The subsoil is brown or grayish brown sandy loam about 24 inches thick. The substratum is pale brown loamy coarse sand.

Included with this soil in mapping are small areas of Olney sandy loam, 0 to 3 percent slopes; Vona sandy loam, 1 to 3 percent slopes; and Wigton loamy sand, 1 to 8 percent slopes.

Permeability of this Bijou soil is rapid. Effective rooting depth is 60 inches or more. Available water capacity is moderate. Organic matter content of the surface layer is low. Surface runoff is slow, and the hazards of erosion and soil blowing are moderate.

Most areas of this soil are used for range, but some areas are used for dryland or irrigated farming.

Corn, sorghum, and wheat are the principal nonirrigated crops. Corn, alfalfa, and pasture are the main crops grown under irrigation. Irrigated crops respond to phosphate and nitrogen fertilizer. Dryfarmed corn and sorghum generally respond to nitrogen fertilizer. Management of crop residue is necessary to control soil blowing. Stripcropping helps to control soil blowing. Sprinkler irrigation is the most suitable and widely practiced method of applying water.

Native vegetation is dominantly blue grama, sand dropseed, needleandthread, side-oats grama, and buckwheat.

Seeding is advisable if the range has deteriorated. Seeding the native grasses is a good practice. If the range

is severely eroded and blowouts have developed, the new seeding should be fertilized.

Windbreaks and environmental plantings are generally suited to this soil. Soil blowing is the main limitation for the establishment of trees and shrubs. This limitation can be overcome by cultivating only in the tree rows and leaving a strip of vegetation between the rows. Supplemental irrigation may be necessary when planting and during dry periods. Trees that are best suited and have good survival are Rocky Mountain juniper, eastern redcedar, ponderosa pine, Siberian elm, Russian-olive, and hackberry. Shrubs that are best suited are skunkbush sumac, lilac, and Siberian peashrub.

This soil is suited to wildlife habitat. It is best suited to habitat for openland and rangeland wildlife. In cropland areas, habitat favorable for ring-necked pheasant, mourning dove, and many nongame species can be developed by establishing areas for nesting and escape cover. For pheasant, the provision of undisturbed nesting cover is vital and should be included in plans for habitat development. Rangeland wildlife, such as pronghorn antelope, can be encouraged by developing livestock watering facilities, properly managing livestock grazing, and reseeding range where needed.

This soil has good potential for use as homesites. Shallow excavation is severely limited because cut banks cave in. This sandy soil requires special management practices to reduce water erosion and soil blowing. Capability subclasses IIIe, irrigated, and IVe, nonirrigated.

7—Bijou sandy loam, 3 to 8 percent slopes. This deep, well drained soil is on flood plains, terraces, and uplands. It formed in sandy alluvium and eolian material derived from arkose deposits. Elevation ranges from 5,400 to 6,200 feet. The average annual precipitation is about 13 inches, the average annual air temperature is about 49 degrees F, and the average frost-free period is about 145 days.

Typically, the surface layer is brown sandy loam about 4 inches thick. The subsoil is brown or grayish brown sandy loam about 24 inches thick. The substratum is pale brown loamy coarse sand.

Included with this soil in mapping are small areas of Olney sandy loam, 3 to 5 percent slopes; Valent sand, 1 to 9 percent slopes; Vona sandy loam, 3 to 9 percent slopes; and Wigton loamy sand, 1 to 8 percent slopes.

Permeability of this Bijou soil is rapid. Effective rooting depth is 60 inches or more. Available water capacity is moderate. Organic matter content of the surface layer is low. Surface runoff is slow, and the hazards of erosion and soil blowing are moderate.

Almost all areas of this soil are used for range.

This soil is suited to the production of native vegetation suitable for grazing. Because of the hazards of water erosion and soil blowing, the soil is not suited to nonirrigated crops.

Native vegetation is dominantly blue grama, sand dropseed, needleandthread, side-oats grama, and buckwheat.

Seeding is a suitable practice if the range has deteriorated. Seeding the native grasses is a good practice. If the range is severely eroded and blowouts have developed, the new seeding should be fertilized. Brush control and grazing management may be needed to improve the depleted range. Grazing should be managed so that enough forage is left standing to protect the soil from blowing, to increase infiltration of water, and to catch and hold snow.

Windbreaks and environmental plantings are generally suited to this soil. Soil blowing is the main limitation for the establishment of trees and shrubs. This limitation can be overcome by cultivating only in the tree rows and leaving a strip of vegetation between the rows. Supplemental irrigation may be needed when planting and during dry periods. Trees that are best suited and have good survival are Rocky Mountain juniper, eastern redcedar, ponderosa pine, Siberian elm, Russian-olive, and hackberry. Shrubs that are best suited are skunkbush sumac, lilac, and Siberian peashrub.

This soil is suited to wildlife habitat. It is best suited to habitat for openland and rangeland wildlife. Rangeland wildlife, such as pronghorn antelope, can be encouraged by developing livestock watering facilities, by properly managing livestock grazing, and by reseeding range where needed.

This soil has good potential for use as homesites. Shallow excavation is severely limited because cut banks cave in. This soil requires special management practices to reduce water erosion and soil blowing. Capability subclass VIe.

8—Blakeland loamy sand, 1 to 9 percent slopes. This deep, somewhat excessively drained soil formed in alluvial and eolian material derived from arkosic sedimentary rock on uplands. The average annual precipitation is about 15 inches, the average annual air temperature is about 47 degrees F, and the average frost-free period is about 135 days.

Typically, the surface layer is dark grayish brown loamy sand about 11 inches thick. The substratum, to a depth of 27 inches, is brown loamy sand; it grades to pale brown sand that extends to a depth of 60 inches.

Included with this soil in mapping are small areas of Bresser sandy loam, 0 to 3 percent slopes; Bresser sandy loam, 3 to 5 percent slopes; Truckton sandy loam, 0 to 3 percent slopes; Truckton sandy loam, 3 to 9 percent slopes; and Stapleton sandy loam, 3 to 8 percent slopes. In some areas, mainly north of Colorado Springs in the Cottonwood Creek area, arkosic beds of sandstone and shale are at a depth of 0 to 40 inches.

Permeability of this Blakeland soil is rapid. Effective rooting depth is 60 inches or more. Available water capacity is low to moderate. Organic matter content of the surface layer is medium. Surface runoff is slow, the hazard of erosion is moderate, and the hazard of soil blowing is severe.

Most areas of this soil are used for range, homesites, and wildlife habitat.

Native vegetation is dominantly western wheatgrass, side-oats grama, and needleandthread. This soil is best suited to deep-rooted grasses.

Proper range management is necessary to prevent excessive removal of plant cover from the soil. Interseeding improves the existing vegetation. Deferment of grazing in spring increases plant vigor and soil stability. Proper location of livestock watering facilities helps to control grazing.

Windbreaks and environmental plantings are fairly well suited to this soil. Blowing sand and low available water capacity are the main limitations for the establishment of trees and shrubs. The soil is so loose that trees need to be planted in shallow furrows and plant cover needs to be maintained between the rows. Supplemental irrigation may be needed to insure survival. Trees that are best suited and have good survival are Rocky Mountain juniper, eastern redcedar, ponderosa pine, and Siberian elm. Shrubs that are best suited are skunkbush sumac, lilac, and Siberian peashrub.

This soil is suited to wildlife habitat. It is best suited to habitat for openland and rangeland wildlife. Rangeland wildlife, such as pronghorn antelope, can be encouraged by developing livestock watering facilities, properly managing livestock grazing, and reseeding range where needed.

This soil has good potential for urban development. Soil blowing is a hazard if protective vegetation is removed. Special erosion control practices must be provided to minimize soil losses. Capability subclass VIe.

9—Blakeland complex, 1 to 9 percent slopes. This complex is on uplands, mostly in the Falcon area. The average annual precipitation is about 15 inches, the average annual air temperature is about 47 degrees F, and the frost-free period is about 135 days.

This complex is about 60 percent Blakeland loamy sand, about 30 percent Fluvaquentic Haplaquolls, and 10 percent other soils.

Included with these soils in mapping are areas of Columbine gravelly sandy loam, 0 to 3 percent slopes, Ellicott loamy coarse sand, 0 to 5 percent slopes, and Ustic Torrifluvents, loamy.

The Blakeland soil is in the more sloping areas. It is deep and somewhat excessively drained. It formed in sandy alluvium and eolian material derived from arkosic sedimentary rock. Typically, the surface layer is dark grayish brown loamy sand about 11 inches thick. The substratum, to a depth of 27 inches, is brown loamy sand; it grades to pale brown sand that extends to a depth of 60 inches or more.

Permeability of the Blakeland soil is rapid. The effective rooting depth is more than 60 inches. The available water capacity is moderate to low. Surface runoff is slow, and the hazard of erosion is moderate.

The Fluvaquentic Haplaquolls are in swale areas. They are deep, poorly drained soils. They formed in alluvium derived from arkosic sedimentary rock. Typically, the surface layer is brown. The texture is variable throughout. The water table is at a depth of 0 to 3 feet.

The Blakeland soil is well suited to deep-rooted grasses. Native vegetation is dominantly western wheatgrass, side-oats grama, and needleandthread. Rangeland vegetation on the Fluvaquentic Haplaquolls is dominantly tall grasses, including sand bluestem, switchgrass, prairie cordgrass, little bluestem, and sand reedgrass. Cattails and bulrushes are common in the swampy areas.

Proper range management is needed to prevent excess removal of plant cover from these soils. It is also needed to maintain the productive grasses. Interseeding improves the existing vegetation. Deferment of grazing during the growing season increases plant vigor and soil stability, and it helps to maintain and improve range condition. Proper location of livestock watering facilities helps to control grazing of animals.

Windbreaks and environmental plantings are fairly well suited to these soils. Blowing sand and low available water capacity are the main limitations to the establishment of trees and shrubs. The soils are so loose that trees need to be planted in shallow furrows and plant cover needs to be maintained between the rows. Supplemental irrigation may be needed to insure survival. Trees that are best suited and have good survival are Rocky Mountain juniper, eastern redcedar, ponderosa pine, and Siberian elm. Shrubs that are best suited are skunkbush sumac, lilac, and Siberian peashrub.

The Blakeland soil is well suited to wildlife habitat. It is best suited to habitat for openland and rangeland wildlife. Rangeland wildlife, such as pronghorn antelope, can be encouraged by developing livestock watering facilities, properly managing livestock grazing, and reseeding range where needed. Wetland wildlife can be attracted to the Fluvaquentic Haplaquolls and the wetland habitat can be enhanced by several means. Shallow water developments can be created by digging or by blasting potholes to create open-water areas. Fencing to control livestock grazing is beneficial, and it allows wetland plants such as cattails, reed canarygrass, and rushes to grow. Control of unplanned burning and prevention of drainage that would remove water from the wetlands are good practices. Openland wildlife use the vegetation on these soils for nesting and escape cover. These shallow marsh areas are especially important for winter cover if natural vegetation is allowed to grow.

The Blakeland soil has good potential for homesites, roads, and streets. It needs to be protected from erosion when vegetation has been removed from building sites. The Fluvaquentic Haplaquolls have poor potential for homesites. Their main limitations for this use are the high water table and the hazard of flooding. Capability subclass VIe.

10—Blendon sandy loam, 0 to 3 percent slopes. This deep, well drained soil formed in sandy arkosic alluvium on alluvial fans and terraces. The average annual precipitation is about 15 inches, the mean annual air temperature is about 47 degrees F, and the average frost-free period is about 135 days.

Typically, the surface layer is dark grayish brown sandy loam about 10 inches thick. The subsoil is dark grayish brown and brown sandy loam about 26 inches thick. The substratum is light brownish gray gravelly sandy loam.

Included with this soil in mapping are small areas of Blakeland loamy sand, 1 to 9 percent slopes; Bresser sandy loam, 0 to 3 percent slopes; Truckton sandy loam, 0 to 3 percent slopes; Ellicott loamy coarse sand, 0 to 5 percent slopes; and Ustic Torrifluvents, loamy.

Permeability of this Blendon soil is moderately rapid. Effective rooting depth is 60 inches or more. Available water capacity is moderate. Surface runoff is slow, and the hazards of erosion and soil blowing are moderate.

Most areas of this soil are used as rangeland, but some small areas are cultivated. Some homesite development has taken place on this soil.

Native vegetation is mainly cool- and warm-season grasses such as western wheatgrass, side-oats grama, and needleandthread.

Proper range management is needed to prevent excessive removal of plant cover from the soil. Interseeding improves the existing vegetation. Deferment of grazing in spring increases plant vigor and soil stability. Proper location of livestock watering facilities helps to control grazing.

Windbreaks and environmental plantings are generally suited to this soil. Soil blowing is the principal limitation to the establishment of trees and shrubs. This limitation can be overcome by cultivating only in the tree rows and leaving a strip of vegetation between the rows. Supplemental irrigation may be needed when planting and during dry periods. Trees that are best suited and have good survival are Rocky Mountain juniper, eastern redcedar, ponderosa pine, Siberian elm, Russian-olive, and hackberry. Shrubs that are best suited are skunkbush sumac, lilac, and Siberian peashrub.

This soil is well suited to wildlife habitat. It is best suited to habitat for openland and rangeland wildlife. In cropland areas, habitat favorable for ring-necked pheasant, mourning dove, and many nongame species can be developed by establishing areas for nesting and escape cover. For pheasant, the provision of undisturbed nesting cover is vital and should be included in plans for habitat development. Rangeland wildlife, such as pronghorn antelope, can be encouraged by developing livestock watering facilities, properly managing livestock grazing, and reseeding range where needed.

This soil has good potential for homesites. The main limitation for the construction of local roads and streets is a moderate frost action potential. Roads can be designed to overcome this limitation. Capability subclass IIIe.

11—Bresser sandy loam, 0 to 3 percent slopes. This deep, well drained soil formed in arkosic alluvium and residuum on terraces and uplands. Elevation ranges from 6,000 to 6,800 feet. The average annual precipitation is about 15 inches, the average annual air temperature is about 47 degrees F, and the average frost-free period is about 135 days.

Typically, the surface layer is grayish brown sandy loam about 5 inches thick. The subsoil is brown sandy clay loam about 31 inches thick. The substratum is light yellowish brown loamy coarse sand to a depth of 60 inches.

Included with this soil in mapping are small areas of Truckton sandy loam, 0 to 3 percent slopes; Ascalon sandy loam, 1 to 3 percent slopes; Fort Collins loam, 0 to 3 percent slopes; and Yoder gravelly sandy loam, 1 to 8 percent slopes. Some areas of Ustic Torrifluvents, loamy, occur along narrow drainageways.

Permeability of this Bresser soil is moderate. Effective rooting depth is 60 inches or more. Available water capacity is moderate. Surface runoff is slow, the hazard of erosion is slight to moderate, and the hazard of soil blowing is moderate.

Most areas of this soil are cultivated. The remaining acreage is used as rangeland.

A rotation of winter wheat and fallow is used because precipitation is insufficient for annual cropping. A feedgrain crop such as millet or sorghum can be substituted for wheat in some years. Crop residue management and minimum tillage are needed to control erosion.

Native vegetation is mainly cool- and warm-season grasses such as western wheatgrass, side-oats grama, and needleandthread.

Proper range management is needed to prevent excessive removal of plant cover from the soil. Interseeding improves the existing vegetation. Deferment of grazing in spring increases plant vigor and soil stability. Proper location of livestock watering facilities helps to control grazing.

Windbreaks and environmental plantings are generally suited to this soil. Soil blowing is the principal limitation to the establishment of trees and shrubs. This limitation can be overcome by cultivating only in the tree rows and leaving a strip of vegetation between the rows. Supplemental irrigation may be needed when planting and during dry periods. Trees that are best suited and have good survival are Rocky Mountain juniper, eastern redcedar, ponderosa pine, Siberian elm, Russian-olive, and hackberry. Shrubs that are best suited are skunkbush sumac, lilac, and Siberian peashrub.

This soil is well suited to wildlife habitat. It is best suited to habitat for openland and rangeland wildlife. In cropland areas, habitat favorable for ring-necked pheasant, mourning dove, and many nongame species can be developed by establishing areas for nesting and escape cover. For pheasant, the provision of undisturbed nesting cover is vital and should be included in plans for habitat development. This is especially true in areas of intensive farming. Rangeland wildlife, such as pronghorn antelope, can be encouraged by developing livestock watering facilities, properly managing livestock grazing, and reseeding range where needed.

This soil has good potential for homesites. Limiting the disturbance of the soil and the removal of existing plant cover during construction helps to control erosion. Capability subclass IIIc.

12—Bresser sandy loam, 3 to 5 percent slopes. This deep, well drained soil formed in arkosic alluvium and residuum on terraces and uplands. Elevation ranges from 6,000 to 6,800 feet. The average annual precipitation is about 15 inches, the average annual air temperature is about 47 degrees F, and the average frost-free period is about 135 days.

Typically, the surface layer is grayish brown sandy loam about 5 inches thick. The subsoil is brown sandy clay loam about 31 inches thick. The substratum is light yellowish brown loamy coarse sand to a depth of 60 inches.

Included with this soil in mapping are small areas of Bresser soils that have a loam surface layer, mostly along the west side of the survey area; Truckton sandy loam, 3 to 9 percent slopes; Ascalon sandy loam, 3 to 9 percent slopes; and Yoder gravelly sandy loam, 1 to 8 percent slopes. In some areas, especially near Calhan and north of Colorado Springs in the vicinity of Cottonwood Creek, some of the parent arkose beds are at a depth of 0 to 40 inches. These beds are in the form of either sandstone or shale.

Permeability of this Bresser soil is moderate. Effective rooting depth is 60 inches or more. Available water capacity is moderate. Surface runoff is slow, the hazard of erosion is slight to moderate, and the hazard of soil blowing is moderate.

Most areas of this soil are cultivated.

A rotation of winter wheat and fallow is used because precipitation is insufficient for annual cropping. A feed grain crop such as millet or sorghum can be substituted for wheat in some years. Because of the slope and texture of this soil, minimum tillage and stripcropping are needed to control erosion. Terraces also help to control erosion.

This soil is well suited to the production of native vegetation suitable for grazing. Native vegetation is mainly cool- and warm-season grasses such as western wheatgrass, side-oats grama, and needleandthread. Proper range management is needed to prevent excessive removal of plant cover from the soil. Interseeding improves the existing vegetation. Deferment of grazing in spring increases plant vigor and soil stability. Proper location of livestock watering facilities helps to control grazing.

Windbreaks and environmental plantings are generally suited to this soil. Soil blowing is the main limitation to the establishment of trees and shrubs. This limitation can be overcome by cultivating only in the tree rows and leaving a strip of vegetation between the rows. Supplemental irrigation may be needed when planting and during dry periods. Trees that are best suited and have good survival are Rocky Mountain juniper, eastern redcedar, ponderosa pine, Siberian elm, Russian-olive, and hackberry. Shrubs that are best suited are skunkbush sumac, lilac, and Siberian peashrub.

This soil is suited to wildlife habitat. It is best suited to habitat for openland and rangeland wildlife. In cropland areas, habitat favorable for ring-necked pheasant, mourning dove, and many nongame species can be developed by establishing areas for nesting and escape cover. For pheasant, undisturbed nesting cover is vital and should be included in plans for habitat development. This is especially true in areas of intensive farming. Rangeland wildlife, such as pronghorn antelope, can be encouraged by developing livestock watering facilities, properly managing livestock grazing, and reseeding range where needed.

This soil has good potential for homesites. Adequate erosion control practices are needed to control surface runoff and keep soil losses to a minimum. Limiting the disturbance of the soil and the removal of existing plant cover during construction helps to control erosion. Capability subclass IVe.

13—Bresser sandy loam, 5 to 9 percent slopes. This deep, well drained soil formed in arkosic alluvium and residuum on terraces and uplands. Elevation ranges from 6,000 to 6,800 feet. The average annual precipitation is about 15 inches, the average annual air temperature is about 47 degrees F, and the average frost-free period is about 135 days.

Typically, the surface layer is grayish brown sandy loam about 5 inches thick. The subsoil is brown sandy clay loam about 31 inches thick. The substratum is light yellowish brown loamy coarse sand to a depth of 60 inches.

Included with this soil in mapping are small areas of Bresser soils that have a loam surface layer, mostly along the western side of the survey area; Truckton sandy loam, 3 to 9 percent slopes; Yoder gravelly sandy loam, 1 to 8 percent slopes; Kutch clay loam, 3 to 5 percent slopes; and Kutch clay loam, 5 to 20 percent slopes. Some areas of Ustic Torrifluvents, loamy, are along narrow drainageways. In some areas, arkose beds are at a depth of 0 to 40 inches. These beds occur as sandstone or shale.

Permeability of this Bresser soil is moderate. Effective rooting depth is 60 inches or more. Available water capacity is moderate. Surface runoff is medium, and the hazard of erosion is moderate. Some gullies are present.

Most areas of this soil are used for range. A small acreage is used for dryland crops, mostly wheat.

This soil is suited to limited cultivation. It is better suited to use as rangeland or pastureland because these uses protect the soil by providing permanent cover. Basin terraces may be needed before seeding this soil back to grass.

Native vegetation is mainly cool- and warm-season grasses such as western wheatgrass, side-oats grama, and needleandthread.

Proper range management is needed to prevent excessive removal of plant cover from the soil. Interseeding improves the existing vegetation. Deferment of grazing in spring increases plant vigor and soil stability. Proper location of livestock watering facilities helps to control grazing.

Windbreaks and environmental plantings are generally suited to this soil. Soil blowing is the main limitation for the establishment of trees and shrubs. This limitation can be overcome by cultivating only in the tree rows and leaving a strip of vegetation between the rows. Supple-

mental irrigation may be needed when planting and during dry periods. Trees that are best suited and have good survival are Rocky Mountain juniper, eastern redcedar, ponderosa pine, Siberian elm, Russian-olive, and hackberry. Shrubs that are best suited are skunkbush sumac, lilac, and Siberian peashrub.

This soil is suited to wildlife habitat. It is best suited to habitat for openland and rangeland wildlife. In cropland areas, habitat favorable for ring-necked pheasant, mourning dove, and many nongame species can be developed by establishing areas for nesting and escape cover. For pheasant, undisturbed nesting cover is vital and should be provided for in plans for habitat development. This is especially true in areas of intensive farming. Rangeland wildlife, such as pronghorn antelope, can be encouraged by developing livestock watering facilities, properly managing livestock grazing, and reseeding range where needed.

This soil has good potential for homesites. Practices are needed to control surface runoff and keep soil losses to a minimum. Limiting the disturbance of the soil and the removal of existing plant cover during construction helps to control erosion. Capability subclass IVe.

14—Brussett loam, 1 to 3 percent slopes. This deep, well drained soil formed in eolian silt and sand on uplands. Elevation ranges from 7,200 to 7,500 feet. The average annual precipitation is about 18 inches, and the average annual air temperature is about 43 degrees F.

Typically, the surface layer is dark grayish brown loam about 8 inches thick. The subsoil is grayish brown and brown clay loam about 26 inches thick. The substratum is pale brown silt loam. Mycelia and soft masses of lime are common in the substratum.

Included with this soil in mapping are small areas of Peyton sandy loam, 1 to 5 percent slopes.

Permeability of this Brussett soil is moderate. Effective rooting depth is 60 inches or more. Available water capacity is high. Surface runoff is slow, and the hazard of erosion is moderate.

Nearly all the acreage of this soil is used for nonirrigated winter wheat, spring oats, and improved pasture that is grazed by cattle and sheep. The chief pasture grasses are smooth brome, intermediate wheatgrass, and pubescent wheatgrass. Winter wheat is grown under a wheat-fallow system. Stubble mulching is the most important conservation practice. Application of fertilizer generally is not needed in the wheat-fallow system. Other crops respond to application of nitrogen. The growing season is too short for warm-season field crops. Management of the plant cover is needed to control erosion.

Rangeland vegetation consists of mountain muhly, little bluestem, needleandthread, Parry oatgrass, and junegrass.

Deferment of grazing in spring helps to maintain the vigor and reproduction of the cool-season bunchgrasses. Fencing and properly distributing livestock watering facilities may be needed to control grazing. Locating salt blocks in areas not generally grazed increases the amount of forage that is used on this soil.

Windbreaks and environmental plantings are generally well suited to this soil. Summer fallow a year prior to planting and continued cultivation for weed control are needed to insure the establishment and survival of plantings. Trees that are best suited and have good survival potential are Rocky Mountain juniper, eastern redcedar, ponderosa pine, Siberian elm, Russian-olive, and hackberry. Shrubs that are best suited are skunkbush sumac, lilac, Siberian peashrub, and American plum.

This soil is suited to wildlife habitat. It is best suited to habitat for openland and rangeland wildlife. In cropland areas, habitat favorable for ring-necked pheasant, mourning dove, and many nongame species can be developed by establishing areas for nesting and escape cover. For pheasant, undisturbed nesting cover is vital and should be provided for in plans for habitat development. This is especially true in areas of intensive farming. Rangeland wildlife, such as pronghorn antelope, can be encouraged by developing livestock watering facilities, properly managing livestock grazing, and reseeding range where needed.

The main limitations for urban development are moderate shrink-swell potential and frost action potential. Dwellings and roads can be designed to overcome these limitations. Permeability adversely affects the performance of septic tank absorption fields. Capability subclass IIIc.

15—Brussett loam, 3 to 5 percent slopes. This deep, well drained soil formed in eolian silt and sand on uplands. Elevation ranges from 7,200 to 7,500 feet. The average annual precipitation is about 18 inches, and the average annual air temperature is about 43 degrees F.

Typically, the surface layer is dark grayish brown loam about 8 inches thick. The subsoil is grayish brown and brown clay loam about 26 inches thick. The substratum is pale brown silt loam. Mycelia and soft masses of lime are common in the substratum.

Included with this soil in mapping are small areas of Peyton sandy lom, 1 to 5 percent slopes, and Peyton-Pring complex, 3 to 8 percent slopes.

Permeability of this Brussett soil is moderate. Effective rooting depth is 60 inches or more. Available water capacity is high. Surface runoff is medium to rapid. The hazard of erosion is moderate, especially when snow melts in spring while the ground is frozen. Some gullies are present.

Nearly all the acreage of this soil is used for nonirrigated winter wheat, spring oats, and improved pasture that is grazed by cattle and sheep. The chief pasture grasses are smooth brome, intermediate wheatgrass, and pubescent wheatgrass. Winter wheat is grown under a wheat-fallow system. Stubble mulching is the most important conservation practice. Application of fertilizer generally is not needed in the wheat-fallow system. Other crops respond to application of nitrogen. The growing season is too short for warm-season field crops. Management of plant cover is needed to control erosion.

Rangeland vegetation consists of mountain muhly, little bluestem, needleandthread, Parry oatgrass, and junegrass.

Deferment of grazing in spring helps to maintain the vigor and production of the cool-season bunchgrasses. Fencing and properly distributing livestock watering facilities may be needed to control grazing. Locating salt blocks in areas not generally grazed increases the amount of forage that is used on this soil.

Windbreaks and environmental plantings are generally well suited to this soil. Summer fallow a year prior to planting and continued cultivation for weed control are needed to insure the establishment and survival of plantings. Trees that are best suited and have good survival potential are Rocky Mountain juniper, eastern redcedar, ponderosa pine, Siberian elm, Russian-olive, and hackberry. Shrubs that are best suited are skunkbush sumac, lilac, Siberian peashrub, and American plum.

This soil is suited to wildlife habitat. It is best suited to habitat for openland and rangeland wildlife. In cropland areas, habitat favorable for ring-necked pheasant, mourning dove, and many nongame species can be developed by establishing areas for nesting and escape cover. For pheasant, undisturbed nesting cover is vital and should be provided for in plans for habitat development. This is especially true in areas of intensive farming. Rangeland wildlife, such as pronghorn antelope, can be encouraged by developing livestock watering facilities, properly managing livestock grazing, and reseeding range where needed.

The main limitations for urban development are moderate shrink-swell potential and frost action potential. Dwellings and roads can be designed to overcome these limitations. Capability subclass IVe.

16—Chaseville gravelly sandy loam, 1 to 8 percent slopes. This deep, somewhat excessively drained soil formed in arkosic alluvial sediment on alluvial fans, terraces, and side slopes. Elevation ranges from 6,100 to 7,000 feet. Average annual precipitation is about 17 inches, average annual air temperature is about 47 degrees F, and the average frost-free season is about 135 days.

Typically, the surface layer is dark grayish brown gravelly sandy loam about 6 inches thick. The next layer is dark grayish brown very gravelly sandy loam about 13 inches thick. The substratum is reddish gray extremely gravelly loamy coarse sand and brown very gravelly loamy sand. The lower part of the subtratum, below a depth of 40 inches, is about 10 percent cobbles.

Included with this soil in mapping are small areas of Jarre gravelly sandy loam, 1 to 8 percent slopes; Bresser sandy loam; Truckton sandy loam; and Ascalon sandy loam.

Permeability of this Chaseville soil is rapid. Effective rooting depth is 60 inches or more. Available water capacity is low. Surface runoff is slow, and the hazard of erosion is moderate.

This soil is used mainly as native rangeland. It is also used as homesites and for wildlife habitat.

Rangeland vegetation is mainly western wheatgrass, side-oats grama, needleandthread, and little bluestem. The main shrub on this site is true mountainmahogany.

Proper location of livestock watering facilities helps to control grazing.

Windbreaks and environmental plantings are suited to this soil. Low available water capacity is the main limitation to the establishment of tree and shrub plantings. Summer fallow a year in advance and continued cultivation for weed control are needed to insure the establishment and survival of plantings. Supplemental irrigation may be needed to insure survival. Trees that are best suited and have good survival are Rocky Mountain juniper, eastern redcedar, ponderosa pine, and Siberian elm. Shrubs that are best suited are skunkbush sumac and lilac.

This soil is suited to wildlife habitat. It is best suited to habitat for openland and rangeland wildlife. Rangeland wildlife, such as pronghorn antelope, can be encouraged by developing livestock watering facilities, properly managing livestock grazing, and reseeding range where needed.

This soil has good potential for homesites. Because of its high gravel content, problems with excavations may arise because cut banks cave in. A surface dressing of topsoil is needed where the very gravelly subsoil is exposed or where vegetation has been removed during site preparation. Caution should be exercised when locating septic tank absorption fields because of possible pollution of water supplies as a result of the rapid permeability of this soil. Capability subclass VIe.

17—Chaseville gravelly sandy loam, 8 to 40 percent slopes. This deep, somewhat excessively drained soil formed in arkosic alluvial sediment on alluvial fans, terraces, and side slopes. Elevation ranges from 6,100 to 7,000 feet. The average annual precipitation is about 17 inches, the average annual air temperature is about 47 degrees F, and the average frost-free season is about 135 days.

Typically, the surface layer is dark grayish brown gravelly sandy loam about 6 inches thick. The subsurface layer is dark grayish brown very gravelly sandy loam about 13 inches thick. The substratum is reddish gray extremely gravelly loamy coarse sand and brown very gravelly loamy sand. The part of the substratum below a depth of 40 inches is about 10 percent cobbles.

Included with this soil in mapping are small areas of Jarre gravelly sandy loam, 1 to 8 percent slopes; Nederland cobbly sandy loam, 9 to 25 percent slopes; and Bresser sandy loam, 5 to 9 percent slopes.

Permeability of this Chaseville soil is rapid. Effective rooting depth is 60 inches or more. Available water capacity is low. Surface runoff is slow to medium, and the hazard of erosion is moderate to high.

This soil is used mainly as rangeland. It is also used for recreation, wildlife habitat, and homesites.

Native vegetation is mainly western wheatgrass, side-oats grama, needleandthread, and little bluestem. The prominent shrub on this site is true mountainmahogany. Yucca is present in some places.

Proper location of livestock watering facilities helps to control grazing.

Windbreaks and environmental plantings are suited to this soil. Low available water capacity is the main limitation to the establishment of tree and shrub plantings. Summer fallow a year in advance and continued cultivation for weed control are needed to insure the establishment and survival of plantings. Supplemental irrigation may be needed to insure survival. Trees that are best suited and have good survival are Rocky Mountain juniper, eastern redcedar, ponderosa pine, and Siberian elm. Shrubs that are best suited are skunkbush sumac and lilac.

Rangeland wildlife such as pronghorn antelope, cottontail, coyote, and scaled quail are best adapted to life on this droughty soil. Forage production is typically low, and proper livestock grazing management is necessary if wildlife and livestock share the range. Livestock watering developments are also important and are used by various wildlife species.

The main limitation of this soil for construction is slope. Special designs for homesites, buildings, and roads are needed to overcome this limitation. The high gravel content may cause problems with excavations, because cut banks cave in. A surface dressing of topsoil is desirable where the very gravelly subsoil is exposed during site preparation. Access roads must be designed to control surface runoff and to help stabilize cut slopes. Caution should be exercised when locating septic tank absorption fields because of the possible pollution of water supplies as a result of the rapid permeability of this soil. Capability subclass VIe.

18—Chaseville-Midway complex. These moderately sloping to steep soils are on terrace breaks and side slopes west of Colorado Springs. Slope ranges from 5 to 50 percent. Elevation ranges from 6,100 to 7,000 feet. The average annual precipitation is about 17 inches, the average annual air temperature is about 47 degrees F, and the average frost-free season is about 135 days.

The Chaseville soil makes up about 70 percent of the complex, the Midway soil about 20 percent, and other soils about 10 percent.

Included with this complex in mapping are areas of Razor clay loam, 3 to 9 percent slopes; Ustic Torrifluvents, loamy; and soils that are similar to Ascalon sandy loam but that have more gravel in the substratum and are redder.

The Chaseville soil is on the steeper slopes and on ridgetops. It is deep and somewhat excessively drained. It formed in arkosic alluvial sediment. Typically, the surface layer is dark grayish brown gravelly sandy loam about 6 inches thick. The subsurface layer is dark grayish brown very gravelly sandy loam about 13 inches thick. The substratum is reddish gray extremely gravelly loamy coarse sand and brown very gravelly loamy sand. The lower part of the substratum, below a depth of 40 inches, is about 10 percent cobbles.

Permeability of the Chaseville soil is rapid. Effective rooting depth is 60 inches or more. Available water capacity is low. Surface runoff is medium, and the hazard of erosion is moderate to high. A few gullies are present.

The Midway soil is on the lower part of the landscape. It is shallow and well drained. It formed in residuum derived from calcareous shale. Typically, the surface layer is light yellowish brown clay loam about 4 inches thick. The underlying material is grayish brown clay 9 inches thick. Pierre shale is at a depth of 13 inches.

Permeability of the Midway soil is slow. Effective rooting depth is 20 inches or less. Available water capacity is low. Surface runoff is medium to rapid, and the hazard of erosion is medium to high. A few gullies are present.

The soils in this complex are used mostly for recreation areas, commercial and residential building sites, and wildlife habitat. The Chaseville soil is a good source of commercial gravel. These soils are also used for grazing.

Native vegetation on the Chaseville soil is mainly western wheatgrass, side-oats grama, needleandthread, and little bluestem. The main shrub in the stand is true mountainmahogany. Yucca is common.

Native vegetation on the Midway soil is mainly western wheatgrass, side-oats grama, little bluestem, blue grama, and alkali sacaton. Browse plants such as mountainmahogany and fourwing saltbush are also present. The presence of princesplume, two-groove milkvetch, and Fremont goldenweed indicates that selenium-bearing plants are in the stand.

Proper location of salt blocks, fences, and watering facilities helps to distribute grazing.

Windbreaks and environmental plantings are suited to the Chaseville soil but are not suited to the Midway soil. Low available water capacity is the principal limitation for the establishment of tree and shrub plantings. Summer fallow a year in advance and continued cultivation for weed control are needed to insure survival. Supplemental irrigation may also be needed to insure survival. Trees that are best suited and have good survival are Rocky Mountain juniper, eastern redcedar, ponderosa pine, and Siberian elm. Shrubs that are best suited are skunkbush sumac and lilac. Onsite investigations are needed to determine where plantings are feasible.

Rangeland wildlife, such as pronghorn antelope, cottontail, coyote, and scaled quail are best adapted to life on these droughty soils. Forage production is typically low, and proper livestock grazing management is necessary if wildlife and livestock share the range. Livestock watering developments are also important and are used by various wildlife species. The treeless Midway soil is relatively unproductive for vegetation, especially in times of drought, when annual production may be as low as 300 pounds per acre. Rangeland wildlife, such as pronghorn antelope and scaled quail, can be encouraged by properly managing livestock grazing, installing livestock watering facilities, and reseeding range where necessary.

The main limitation for construction on the Chaseville soil is slope. Special designs for building sites, buildings, and roads are needed to overcome this limitation. The high gravel content may cause problems with excavations because cut banks cave in. A surface dressing of topsoil may be desirable on the Chaseville soil where the very

gravelly subsoil is exposed during site preparation. Access roads must be designed to control surface runoff and help stabilize cut slopes. The Midway soil has poor potential for homesites and roads because of shallow depth to shale, high frost-action potential, and high shrink-swell potential. Special designs are necessary to overcome these limitations. Capability subclass VIIe.

19—Columbine gravelly sandy loam, 0 to 3 percent slopes. This deep, well drained to excessively drained soil formed in coarse textured material on alluvial terraces and fans and on flood plains. Elevation ranges from 6,500 to 7,300 feet. The average annual precipitation is about 15 inches, the average annual air temperature is about 47 degrees F, and the average frost-free period is about 135 days.

Typically, the surface layer is grayish brown gravelly sandy loam about 14 inches thick. The underlying material is light yellowish brown very gravelly loamy sand.

Included with this soil in mapping are small areas of Stapleton sandy loam, 3 to 8 percent slopes; Blendon sandy loam, 0 to 3 percent slopes; Louviers silty clay loam, 3 to 18 percent slopes; and Fluvaquentic Haplaquolls, nearly level. In places the parent arkose beds of sandstone or shale are at a depth of 0 to 40 inches.

Permeability of this Columbine soil is very rapid. Effective rooting depth is 60 inches or more. Available water capacity is low to moderate. Surface runoff is slow, and the hazard of erosion is slight to moderate.

This soil is used mainly for grazing livestock and for wildlife habitat. It is also used for homesites.

Native vegetation is mainly western wheatgrass, side-oats grama, needleandthread, and little bluestem. The main shrub is true mountainmahogany.

Proper location of livestock watering facilities helps to control grazing.

Windbreaks and environmental plantings are fairly well suited to this soil. Blowing sand and low available water capacity are the principal limitations to the establishment of trees and shrubs. The soil is so loose that trees need to be planted in the rows. Supplemental irrigation may be needed to insure survival. Trees that are best suited and have good survival are Rocky Mountain juniper, eastern redcedar, ponderosa pine, and Siberian elm. Shrubs that are best suited are skunkbush sumac, lilac, and Siberian peashrub.

Rangeland wildlife, such as pronghorn antelope, cottontail, coyote, and scaled quail, is best adapted to life on this droughty soil. Forage production is typically loam, and proper livestock grazing management is necessary if wildlife and livestock share the range. Livestock watering developments are also important and are used by various wildlife species.

The main limitation of this soil for urban development is a hazard of flooding in some areas. Care must be taken when locating septic tank absorption fields because of possible pollution as a result of the very rapid permeability of this soil. Capability subclass VIe.

20—Connerton-Rock outcrop complex, 8 to 90 percent slopes. This moderately sloping to extremely steep complex is in the Garden of the Gods area, west of Colorado Springs. Elevation ranges from 6,200 to 6,500 feet. The average annual precipitation is about 16 inches, and the average annual air temperature is about 47 degrees F.

The Connerton soil makes up about 45 percent of the complex and has slopes of 8 to 30 percent, Rock outcrop makes up about 40 percent, and other soils about 15 percent.

Included with this complex in mapping are areas of Neville fine sandy loam, 3 to 9 percent slopes; Penrose-Manvel complex, 3 to 45 percent slopes; and Fortwingate-Rock outcrop complex, 15 to 60 percent slopes. Also included are small areas of soils that contain more sand than is typical for the series.

The Connerton soil is deep and well drained. It formed in alluvium derived from reddish sandstone on moderately sloping alluvial fans and valley side slopes. Typically, the surface layer is reddish brown loam about 13 inches thick. The substratum is reddish brown sandy clay loam.

Permeability of the Connerton soil is moderate. Effective rooting depth is 60 inches or more. Available water capacity is high. Surface runoff is medium to rapid, and the hazard of erosion is moderate. A few gullies are in areas of this soil, especially along paths and trails and in drainageways.

Rock outcrop is in long, narrow bands in the form of cliffs or as monoliths and monuments. It consists of red to gray sandstone and limestone.

This complex is used for recreation, wildlife habitat, homesites, and limited livestock grazing.

Native vegetation is mainly western wheatgrass, needlegrasses, big bluestem, side-oats grama, blue grama, and native bluegrasses.

If the range has deteriorated, blue grama, junegrass, and native bluegrasses increase. Sleepygrass and annuals replace these grasses if the range has seriously deteriorated. Seeding is a good practice if the range is in poor condition. Seeding of the native vegetation is desirable, but the range can also be seeded with tame species of grasses such as Nordan crested wheatgrass, Russian wildrye, pubescent wheatgrass, or intermediate wheatgrass.

This complex is suited to the production of juniper and pinyon pine. It is capable of producing 4 cords per acre in a stand of trees that average 5 inches in diameter at a height of 1 foot. The limitations for the production of wood crops are the presence of stones on the surface and a high hazard of erosion. Stones on the surface can influence felling, yarding, and other operations involving the use of equipment. Special care must be taken to minimize erosion when harvesting timber.

This complex is relatively unproductive for vegetation, especially in times of drought, when annual production may be as low as 300 pounds per acre. Rangeland wildlife, such as antelope and scaled quail, can be encouraged by properly managing livestock grazing, installing livestock watering facilities, and reseeding range where needed.

The main limitations of this complex for urban development are high frost action potential, moderate shrink-swell potential, the presence of stones and rock outcrop, and steep slopes. This complex requires special site or building designs because of the shrink-swell potential. Special designs are also needed when building on the steeper slopes. The roads and streets must have adequate cut-slope grade and be provided with drains to control surface runoff and keep soil losses to a minimum. Frost action is also a potential problem for the design of roads and streets. Capability subclass VIIe.

21—Cruckton sandy loam, 1 to 9 percent slopes. This deep, well drained soil formed in arkosic sandy loam deposits on uplands. Elevation ranges from 7,200 to 7,600 feet. The average annual precipitation is about 17 inches, the average annual air temperature is about 43 degrees F, and the average frost-free period is about 115 days.

Typically, the surface layer is dark grayish brown sandy loam about 4 inches thick. The subsoil is grayish brown sandy loam about 24 inches thick. The substratum is pale brown loamy coarse sand.

Included with this soil in mapping are small areas of Peyton sandy loam, 1 to 5 percent slopes, Peyton sandy loam, 5 to 9 percent slopes, and Pring coarse sandy loam, 3 to 8 percent slopes.

Permeability of this Cruckton soil is moderately rapid. Effective rooting depth is 60 inches or more. Available water capacity is moderate to high. Surface runoff is slow to medium, and the hazard of erosion is moderate. In places runoff from snowmelt in spring causes rills and small gullies to form in cultivated fields.

Most of this soil is in native grass that is used for grazing livestock. A small acreage on some of the more gentle slopes is used for small grain and corn for silage.

Native vegetation is mainly mountain muhly, bluestem, mountain brome, needleandthread, and blue grama. The soil is subject to invasion by Kentucky bluegrass and Gambel oak. Noticeable forbs are hairy goldenrod, geranium, milkvetch, low larkspur, fringed sage, and buckwheat.

Proper location of livestock watering facilities helps to control grazing. Timely deferment of grazing is needed to protect the plant cover.

Windbreaks and environmental plantings are generally suited to this soil. Soil blowing is the main limitation to the establishment of trees and shrubs. This limitation can be overcome by cultivating only in the tree rows and leaving a strip of vegetation between the rows. Supplemental irrigation may be needed when planting and during dry periods. Trees that are best suited and have good survival are Rocky Mountain juniper, eastern redcedar, ponderosa pine, Siberian elm, Russian-olive, and hackberry. Shrubs that are best suited are skunkbush sumac, lilac, and Siberian peashrub.

This soil is suited to wildlife habitat. It is best suited to habitat for openland and rangeland wildlife. Rangeland wildlife, such as pronghorn antelope, can be encouraged by developing livestock watering facilities, properly managing livestock grazing, and reseeding range where needed.

This soil has good potential for use as homesites. Special design of roads and streets is needed because of frost action. Installation of drains helps to control surface runoff and keeps soil losses to a minimum. Capability subclass VIe.

22—Cushman loam, 1 to 5 percent slopes. This moderately deep, well drained soil formed in calcareous loamy material derived from weakly consolidated beds of sandstone and shale on uplands. Elevation ranges from 6,000 to 6,500 feet. The average annual precipitation is about 15 inches, the average annual air temperature is about 47 degrees F, and the average frost-free period is about 135 days.

Typically, the surface layer is grayish brown loam about 5 inches thick. The subsoil is brown sandy clay loam about 18 inches thick. The substratum is grayish brown fine sandy loam about 7 inches thick. Interbedded sandstone and shale are at a depth of 30 inches.

Included with this soil in mapping are small areas of Bresser sandy loam, 0 to 3 percent slopes; Kutch clay loam, 3 to 5 percent slopes; and Louviers silty clay loam, 3 to 18 percent slopes.

Permeability of this Cushman soil is moderate. Effective rooting depth is 20 to 40 inches. Available water capacity is low to moderate. Surface runoff is medium, and the hazard of erosion is moderate.

This soil is suitable for cultivation and is generally used for this purpose. Winter wheat is the main crop, and this is followed by a year of summer fallow because of limited precipitation. Feed grains such as millet and sorghum may be substituted for wheat in some years. Crop residue management and minimum tillage are the practices needed to protect this soil. The soil has a high producing potential, but production is reduced by low precipitation.

This soil is well suited to the production of native vegetation suitable for grazing. Native vegetation consists of western wheatgrass, needlegrasses, big bluestem, sideoats grama, blue grama, and native bluegrasses.

If the range has deteriorated, blue grama, junegrass, and native bluegrasses increase. Sleepygrass and annuals replace these grasses if the range is seriously deteriorated. Proper range management and proper location of livestock watering facilities are essential to help maintain the more desirable plants on this soil. Seeding is a good practice if the range is in poor condition. Seeding of the native vegetation is desirable, but the range can also be seeded with tame species of grasses such as Nordan crested wheatgrass, Russian wildrye, pubescent wheatgrass, or intermediate wheatgrass.

Windbreaks and environmental plantings are generally not suited to this soil. Onsite investigation is needed to determine if plantings are feasible.

This soil is suited to wildlife habitat. It is best suited to habitat for openland and rangeland wildlife. In cropland areas, habitat favorable for ring-necked pheasant, mourning dove, and many nongame species can be developed by establishing areas for nesting and escape cover. For pheasant, the provision of undisturbed nesting cover is

vital and should be included in plans for habitat development. This is especially true in areas of intensive farming. Rangeland wildlife, such as pronghorn antelope, can be encouraged by developing livestock watering facilities, properly managing livestock grazing, and reseeding range where needed.

The main limitation of this soil for building sites and roads is the presence of sandstone and shale at a depth of 20 to 40 inches. Building sites and roads must be designed to overcome this limitation. The use of heavy equipment helps to minimize this limitation. The use of septic tank absorption fields is severely limited because of the shallow depth to sandstone and shale. Capability subclass IVe.

23—Cushman loam, 5 to 15 percent slopes. This moderately deep, well drained soil formed in calcareous loamy material derived from weakly consolidated beds of sandstone and shale on uplands. Elevation ranges from 6,000 to 6,500 feet. The average annual precipitation is about 15 inches, the average annual air temperature is about 47 degrees F, and the average frost-free period is about 135 days.

Typically, the surface layer is grayish brown loam about 5 inches thick. The subsoil is brown sandy clay loam about 18 inches thick. The substratum is grayish brown fine sandy loam about 7 inches thick. Interbedded sandstone and shale are at a depth of 30 inches.

Included with this soil in mapping are small areas of Bresser sandy loam, 5 to 9 percent slopes; Kutch clay loam, 5 to 20 percent slopes; Louviers silty clay loam, 3 to 18 percent slopes; and Terry sandy loam, 1 to 8 percent slopes.

Permeability of this Cushman soil is moderate. Effective rooting depth is 20 to 40 inches. Available water capacity is low to moderate. Surface runoff is medium, and the hazard of erosion is moderate.

This soil is used mainly for grazing livestock.

Native vegetation is dominantly western wheatgrass, needlegrasses, big bluestem, side-oats grama, blue grama, and native bluegrasses.

This soil is well suited to the production of native vegetation suitable for grazing. If the range has deteriorated, blue grama, junegrass, and native bluegrasses increase. Sleepygrass and annuals replace these grasses if the range has seriously deteriorated. Proper range management and proper location of livestock watering facilities are essential to maintain the potential vegetation on this soil. Seeding is a good practice if the range is in poor condition. Seeding of the native vegetation is desirable, but the range may also be seeded with tame species of grasses such as Nordan crested wheatgrass, Russian wildrye, pubescent wheatgrass, or intermediate wheatgrass.

Windbreak and environmental plantings are generally not suited to this soil. Onsite investigation is needed to determine if plantings are feasible.

This soil is suited to wildlife habitat. It is best suited to habitat for openland and rangeland wildlife. Rangeland wildlife, such as pronghorn antelope, can be encouraged by developing livestock watering facilities, properly managing livestock grazing, and reseeding range where needed.

The presence of sandstone and shale at a depth of 20 to 40 inches is the main limitation to the use of this soil as homesites. Slopes are also a limitation to construction in places. Construction of septic tank absorption fields is limited by the depth to bedrock and the percolation rate. When preparing building sites, the limitation of depth of sandstone and shale can be overcome by the use of heavy equipment. Capability subclass VIe.

24—Cushman-Kutch complex, 3 to 12 percent slopes. This complex consists of gently sloping to strongly sloping soils on uplands. Elevation ranges from 6,000 to 6,500 feet. The average annual precipitation is about 15 inches, and the mean annual air temperature is about 47 degrees F.

The complex is about 40 percent Cushman soils, 30 percent Kutch soils, and 30 percent other soils.

Included with these soils in mapping are areas of Bresser sandy loam, 3 to 5 percent slopes; Bresser sandy loam, 5 to 9 percent slopes; Fort Collins loam, 3 to 8 percent slopes; Manzanola clay loam, 3 to 9 percent slopes; and Terry sandy loam, 1 to 8 percent slopes.

The Cushman soil is moderately deep and well drained. It formed in calcareous loamy material derived from weakly consolidated beds of sandstone and shale. Typically, the surface layer is grayish brown loam about 5 inches thick. The subsoil is brown sandy clay loam about 18 inches thick. The substratum is grayish brown fine sandy loam about 7 inches thick. Interbedded sandstone and shale are at a depth of 30 inches.

Permeability of the Cushman soil is moderate. Effective rooting depth is 20 to 40 inches. Available water capacity is low to moderate. Surface runoff is medium, and the hazard of erosion is moderate.

The Kutch soil is moderately deep and well drained. It formed in fine-textured calcareous material derived from clay shale. Typically, the surface layer is grayish brown clay loam about 5 inches thick. The subsoil is brown and grayish brown heavy clay loam about 23 inches thick. The substratum, about 8 inches thick, is light gray extremely shaly clay loam. Hard clay shale is at a depth of 36 inches.

Permeability of the Kutch soil is slow. Effective rooting depth is 20 to 40 inches. Available water capacity is moderate. Surface runoff is medium to rapid, and the hazard of erosion is moderate. Some gullies have formed in drainageways.

The soils in this complex are used mostly for grazing livestock.

The Cushman soil is well suited to the production of native vegetation suitable for grazing. Native vegetation on this soil is mainly western wheatgrass, needlegrasses, big bluestem, side-oats grama, and blue grama. The Kutch soil produces vegetation that is suitable for grazing. Rangeland vegetation is mainly western wheatgrass, blue grama, alkali sacaton, needleandthread, and junegrass.

The presence of princesplume, two-groove milkvetch, and Fremont goldenweed indicates that selenium-bearing plants are in the stand.

Good grazing management is essential to maintain desirable grasses on the Kutch soil. Deferment of grazing early in spring helps to maintain the health and vigor of cool-season grasses. Proper location of livestock watering facilities helps to control grazing.

If the range has deteriorated, blue grama, junegrass; and native bluegrasses increase. Sleepygrass and annuals replace these grasses if the range has seriously deteriorated. Proper range management and proper location of livestock watering facilities are essential to maintain the potential vegetation on these soils. Seeding is advisable if the range is in poor condition. Seeding of the native vegetation is desirable, but the range can also be seeded with tame species of grasses such as Nordan crested wheatgrass, Russian wildrye, pubescent wheatgrass, or intermediate wheatgrass.

This complex is suited to wildlife habitat. It is best suited to habitat for openland and rangeland wildlife. Rangeland wildlife, such as pronghorn antelope, can be encouraged by developing livestock watering facilities, properly managing livestock grazing, and reseeding range where needed.

The main limitations of these soils for homesites are depth to sandstone and shale, permeability, and the shrink-swell potential of the subsoil. Dwellings and roads need to be designed to offset these limitations. Septic tank absorption fields do not function properly because of the depth to shale and permeability. Capability subclass IVe.

25—Elbeth sandy loam, 3 to 8 percent slopes. This deep, well drained soil formed in material transported from arkose deposits on uplands. Elevation ranges from 7,300 to 7,600 feet. The average annual precipitation is about 18 inches, the average annual air temperature is about 43 degrees F, and the average frost-free period is about 120 days.

Typically the surface layer is very dark grayish brown sandy loam about 3 inches thick. The subsurface layer is light gray loamy sand about 20 inches thick. The subsoil is brown sandy clay loam about 45 inches thick. The substratum is light brown sandy clay loam.

Included with this soil in mapping are small areas of Tomah-Crowfoot loamy sands, 3 to 8 percent slopes; Kettle gravelly loamy sand, 3 to 8 percent slopes; and Peyton-Pring complex, 3 to 8 percent slopes.

Permeability of this Elbeth soil is moderate. Effective rooting depth is 60 inches or more. Available water capacity is high. Surface runoff is slow to medium, and the hazard of erosion is moderate.

This soil is used for woodland, limited livestock grazing, recreation, wildlife habitat, and homesites.

This soil is suited to the production of ponderosa pine. It is capable of producing about 2,240 cubic feet, or 4,900 board feet (International rule), of merchantable timber per acre from a fully stocked, even-aged stand of 80-year-old trees. Conventional methods can be used for harvesting, but operations may be restricted during wet periods. Reforestation, after harvesting, must be carefully managed to reduce competition of undesirable understory plants.

Woodland wildlife, such as mule deer and wild turkey, is attracted to this soil because of its potential to produce ponderosa pine, Gambel oak, and various grasses and shrubs. Water developments, such as guzzlers, would enhance populations of wild turkey as well as other kinds of wildlife. Where wildlife and livestock share the same range, proper grazing management is needed to prevent overuse and to reduce competition. Livestock watering facilities would also benefit wildlife on this soil.

This soil has good potential for homesites. The main limitation is the moderate shrink-swell potential in the subsoil. Special road design is necessary on this soil to overcome the limitations of shrink-swell potential and frost action. Special planning is needed on this soil to minimize site disturbance and tree and seedling damage. During seasons of low precipitation, fire may become a hazard to homesites on this soil. The hazard can be minimized by installing firebreaks and reducing the amount of potential fuel on the forest floor. Capability subclass VIe.

26—Elbeth sandy loam, 8 to 15 percent slopes. This deep, well drained soil formed in material transported from arkose deposits on uplands. Elevation ranges from 7,300 to 7,600 feet. The average annual precipitation is about 18 inches, the average annual air temperature is about 43 degrees F, and the average frost-free season is about 120 days.

Typically, the surface layer is very dark grayish brown sandy loam about 3 inches thick. The subsurface layer is light gray loamy sand about 20 inches thick. The subsoil is brown sandy clay loam about 45 inches thick. The substratum is light brown.

Included with this soil in mapping are small areas of Tomah-Crowfoot loamy sand, 8 to 15 percent slopes; Peyton-Pring complex, 8 to 15 percent slopes; Kettle gravelly loamy sand, 8 to 40 percent slopes; and Kettle-Rock outcrop complex.

Permeability of this Elbeth soil is moderate. Effective rooting depth is 60 inches or more. Available water capacity is high. Surface runoff is slow to medium, and the hazard of erosion is moderate.

This soil is used for woodland, limited livestock grazing, recreation, wildlife habitat, and homesites.

This soil is suited to the production of ponderosa pine. It is capable of producing about 2,240 cubic feet, or 4,900 board feet (International rule), of merchantable timber per acre from a fully stocked, even-aged stand of 80-year-old trees. Conventional methods can be used for harvesting, but operations may be restricted during wet periods. Reforestation, after harvesting, must be carefully managed to reduce competition of undesirable understory plants.

Woodland wildlife, such as mule deer and wild turkey, is attracted to this soil because of its potential to produce ponderosa pine, Gambel oak, and various grasses and shrubs. Water developments, such as guzzlers, would enhance populations of wild turkey as well as other kinds of wildlife. Where wildlife and livestock share the same range, proper grazing management is needed to prevent overuse and to reduce competition. Livestock watering facilities would also benefit wildlife on this soil.

This soil has good potential for use as homesites. The main limitation is the moderate shrink-swell potential in the subsoil and frost action potential. Special road design is necessary on this soil to overcome these limitations. Slope is also a limitation. Special planning is needed on this soil to minimize site disturbance and tree and seedling damage. During seasons of low precipitation, fire may become a hazard to homesites on this soil. The hazard can be minimized by installing firebreaks and reducing the amount of potential fuel on the forest floor. Capability subclass VIe.

27—Elbeth-Pring complex, 5 to 30 percent slopes. These moderately sloping to steep soils are on upland side slopes and ridges. Elevation ranges from 7,200 to 7,400 feet. The average annual precipitation is about 18 inches, the average annual air temperature is about 43 degrees F, and the average frost-free period is about 120 days.

The Elbeth soil makes up about 60 percent of the complex, the Pring about 20 percent, and other soils about 20 percent. The Elbeth soil has slopes of 5 to 15 percent, and the Pring soil has slopes of 5 to 30 percent.

Included with these soils in mapping are areas of Peyton-Pring complex, 8 to 15 percent slopes, Kettle-Rock outcrop complex, and ridges that are covered with gravel and cobbles.

The Elbeth soil is deep and well drained. It formed in material transported from arkose deposits. Typically, the surface layer is very dark grayish brown sandy loam about 3 inches thick. The subsurface layer is light gray loamy sand about 20 inches thick. The subsoil is brown sandy clay loam about 45 inches thick. The substratum is light brown sandy clay loam.

Permeability of the Elbeth soil is moderate. Effective rooting depth is 60 inches or more. Available water capacity is high. Surface runoff is medium to rapid, and the hazard of erosion is moderate to high. Deep gullies occur throughout areas of this soil. Some soil slippage occurs on some of the steeper slopes.

The Pring soil is deep and well drained. It formed in arkosic sediment. Typically, the surface layer is dark grayish brown coarse sandy loam about 4 inches thick. The next layer is dark grayish brown coarse sandy loam about 10 inches thick. The underlying material is pale brown gravelly sandy loam to a depth of 60 inches.

Permeability of the Pring soil is rapid. Effective rooting depth is 60 inches or more. Available water capacity is moderate. Surface runoff is medium, and the hazard of erosion is moderate.

The soils in this complex are used for woodland, recreation, livestock grazing, and homesites.

The Elbeth soil is suited to the production of ponderosa pine. It is capable of producing about 2,240 cubic feet, or 4,900 board feet (International rule), of merchantable timber per acre from a fully stocked, even-aged stand of 80-year-old trees. Conventional methods can be used for harvesting, but operations may be restricted during wet periods. Reforestation, after harvesting, must be carefully managed to reduce competition of undesirable understory plants.

The Pring soil is suited to the production of native vegetation suitable for grazing by cattle and sheep. Rangeland vegetation is mainly mountain muhly, little bluestem, needleandthread, Parry oatgrass, and junegrass.

Deferment of grazing in spring promotes plant vigor and reproduction of the cool-season bunchgrasses. Fencing and proper location of livestock watering facilities may be needed to obtain proper distribution of grazing. Locating salt blocks in areas not generally grazed increases the use of the available forage.

Woodland wildlife such as mule deer and wild turkey is attracted to the Elbeth soil because of its potential to produce ponderosa pine, Gambel oak, and various grasses and shrubs. Water developments, such as guzzlers, would enhance populations of wild turkey as well as other kinds of wildlife. Where wildlife and livestock share the same range, proper grazing management is needed to prevent overuse and to reduce competition. Livestock watering facilities would also benefit wildlife on this soil.

The Pring soil is suited to wildlife habitat. It is best suited to habitat for openland and rangeland wildlife. Rangeland wildlife, such as pronghorn antelope, can be encouraged by developing livestock watering facilities, properly managing livestock grazing, and reseeding range where needed.

The main limitations of this complex for construction are the moderate shrink-swell potential in the subsoil of the Elbeth soil and the steep slopes of both soils. Special site or building designs for dwellings and roads are required to offset these limitations. Special practices must be used to minimize surface runoff and keep soil erosion to a minimum. Capability subclass VIe.

28—Ellicott loamy coarse sand, 0 to 5 percent slopes. This deep, somewhat excessively drained soil is on terraces and flood plains (fig. 1). The average annual precipitation is about 14 inches, the average annual air temperature is about 48 degrees F, and the average frost-free period is about 135 days.

Typically, the surface layer is grayish brown loamy coarse sand about 4 inches thick. The underlying material to a depth of 60 inches is light brownish gray coarse sand stratified with layers of loamy sand, loamy coarse sand, and coarse sandy loam.

Included with this soil in mapping are small areas of Ustic Torrifluvents, loamy; Fluvaquentic Haploquolls, nearly level; Blakeland loamy sand, 1 to 9 percent slopes; Blendon sandy loam; and Truckton sandy loam, 0 to 3 percent slopes.

Permeability of this Ellicott soil is rapid. Effective rooting depth is 60 inches or more. Available water capacity is low. Surface runoff is slow, the hazard of erosion is high, and the hazard of soil blowing is moderate.

Almost all areas of this soil are used as rangeland.

The rangeland vegetation on this soil is mainly switchgrass, needleandthread, sand bluestem, and prairie sand reedgrass.

Seeding is a good practice if the range is in poor condition. Seeding of the native grasses is desirable. Yellow or white sweetclover may be added to the seeding mixture to provide a source of nitrogen for the grasses. Too much clover can create a danger of bloat by grazing animals. This soil is subject to flooding and should be managed to keep a heavy cover of grass to protect the soil. Fencing is a necessary practice in range management. Brush control and grazing management may help to improve deteriorated range.

Windbreaks and environmental plantings are fairly well suited to this soil. Blowing sand and low available water capacity are the principal limitations for the establishment of trees and shrubs. The soil is so loose that trees need to be planted in shallow furrows and plant cover needs to be maintained between the rows. Supplemental irrigation may be needed to insure survival of trees. Trees that are best suited and have good survival are Rocky Mountain juniper, eastern redcedar, ponderosa pine, and Siberian elm. Shrubs that are best suited to skunkbush sumac, lilac, and Siberian peashrub.

Rangeland wildlife, such as antelope, cottontail, coyote, and scaled quail, is best adapted to life on this droughty soil. Forage production is typically low, and proper livestock grazing management is needed if wildlife and livestock share the range. Livestock watering developments are also important and are used by various wildlife species.

The main limitation of this soil for construction is the hazard of flooding. All construction on this soil should be kept off the flood plain as much as possible. Capability subclass VIw.

29—Fluvaquentic Haplaquolls, nearly level. These deep, poorly drained soils are in marshes, in swales, and on creek bottoms. The average annual precipitation is about 14 inches, and the average annual air temperature is about 47 degrees F.

Included with these soils in mapping are small areas of Ustic Torrifluvents, loamy; Blakeland loamy sand, 1 to 9 percent slopes; Columbine gravelly sandy loam, 0 to 3 percent slopes; and Ellicott loamy coarse sand, 0 to 5 percent slopes.

These soils are stratified. Typically, the surface layer is light gray to very dark gray loamy fine sand to gravelly loam 2 to 6 inches thick. The underlying material, 48 to 58 inches thick, is very pale brown to gray, stratified heavy sandy clay loam to sand and gravel. The lower part of some of the soils, at depths ranging from 18 to 48 inches, ranges from light blueish gray to greenish gray. The water table is usually at a depth of less than 48 inches, and it is on the surface during part of the year.

Permeability of these soils is moderate. Effective rooting depth is limited by the water table. Available water capacity is moderate. Surface runoff is slow, and the hazard of erosion is slight. At times overflow deposits a damaging amount of silt and sand in the lower lying areas.

These soils are in meadow. They are used for native hay or for grazing.

These soils are well suited to the production of native vegetation suitable for grazing. The vegetation is mainly switchgrass, indiangrass, sedges, rushes, prairie cordgrass, western wheatgrass, and bluegrass. Cattails and bulrushes commonly grow in the swampy areas.

Management of distribution of livestock and stocking rates is necessary on these soils to avoid abuse of the range. In large areas, fences should be used to control grazing.

Wetland wildlife can be attracted to these soils and the wetland habitat enhanced by several means. Shallow water developments can be created by digging or by blasting potholes to create open-water areas. Fencing to control livestock use is beneficial, and it allows wetland plants such as cattails, reed canarygrass, and rushes to grow. Control of unplanned burning and prevention of drainage that would remove water from the wetlands are also good practices. These shallow marsh areas are often especially important for winter cover if natural vegetation is allowed to grow.

These soils are severely limited for use as homesites. The main limitations are a high water table and a hazard of periodic flooding. Community sewerage systems are needed because the high water table prevents septic tank absorption fields from functioning properly. Roads must also be designed to prevent frost-heave damage. Capability subclass Vw.

30—Fort Collins loam, 0 to 3 percent slopes. This deep, well drained soil formed in medium textured alluvium on uplands. Elevation ranges from 5,200 to 6,500 feet. The average annual precipitation ranges from about 13 inches at the lower elevations to about 15 inches at the higher elevations; the average annual temperature is about 49 degrees F; and the average frost-free period is about 145 days.

Typically, the surface layer is brown loam about 6 inches thick. The subsoil is brown clay loam about 15 inches thick. The substratum is pale brown loam.

Included with this soil in mapping are small areas of Stoneham sandy loam, 3 to 8 percent slopes; Keith silt loam, 0 to 3 percent slopes; Olney sandy loam, 0 to 3 percent slopes; Bresser sandy loam, 0 to 3 percent slopes; and Wiley silt loam, 1 to 3 percent slopes.

Permeability of this Fort Collins soil is moderate. Effective rooting depth is 60 inches or more. Available water capacity is high. Surface runoff is medium, and the hazard of erosion is moderate.

This soil is used as rangeland and for dryland farming. Wheat and feed grains such as millet are the crops commonly grown. Crop residue management, minimum tillage,

and stripcropping are useful conservation measures if this soil is cropped. Periods of fallow are needed.

This soil is well suited to the production of native vegetation suitable for grazing. Native vegetation is mainly blue grama, western wheatgrass, side-oats grama, and sand dropseed. Needleandthread, big bluestem, and native bluegrasses also grow in areas of this soil in the northern part of the survey area.

Fencing and properly locating livestock watering facilities help to control grazing. Deferment of grazing may be needed to maintain the desired balance between livestock use and forage production. In areas where the plant cover has been depleted, pitting can be used to help the natural vegetation recover. Chemical control practices may be needed in disturbed areas where dense stands of pricklypear occur. Ample amounts of litter and forage should be left on the soil because of the high hazard of soil blowing.

Windbreaks and environmental plantings are generally suited to this soil. Summer fallow a year prior to planting and continued cultivation for weed control are needed to insure establishment and survival of plantings. Trees that are best suited and have good survival are Rocky Mountain juniper, eastern redcedar, ponderosa pine, Siberian elm, Russian-olive, and hackberry. Shrubs that are best suited are skunkbush sumac, lilac, Siberian peashrub, and American plum.

This soil is suited to wildlife habitat. It is best suited to habitat for openland and rangeland wildlife. In cropland areas, habitat favorable for ring-necked pheasant, mourning dove, and many nongame species can be developed by establishing wildlife areas for nesting and escape cover. For pheasant, nesting cover is vital and should be provided for in plans for habitat development. This is especially true in areas of intensive farming. Rangeland wildlife, such as pronghorn antelope, can be encouraged by developing livestock watering facilities, properly managing livestock grazing, and reseeding range where needed.

This soil has good potential for use as homesites. Its main limitation is a limited ability to support a load. Roads can be designed to offset this limitation. Capability subclass IVc.

31—Fort Collins loam, 3 to 8 percent slopes. This deep, well drained soil formed in medium textured alluvium on uplands. Elevation ranges from 5,200 to 6,500 feet. The average annual precipitation ranges from about 13 inches at the lower elevations to about 15 inches at the higher elevations, the average annual temperature is about 49 degrees F, and the average frost-free period is about 145 days.

Typically, the surface layer is brown loam about 6 inches thick. The subsoil is brown clay loam about 15 inches thick. The substratum is pale brown loam.

Included with this soil in mapping are small areas of Stoneham sandy loam, 3 to 8 percent slopes; Keith silt loam, 0 to 3 percent slopes; Bresser sandy loam, 5 to 9 percent slopes; and Wiley silt loam, 3 to 9 percent slopes.

Permeability of this Fort Collins soil is moderate. Effective rooting depth is 60 inches or more. Available water capacity is high. Surface runoff is medium, and the hazard of erosion is moderate.

This soil is well suited to the production of native vegetation suitable for grazing. Native vegetation is mainly blue grama, western wheatgrass, side-oats grama, and sand dropseed. Needleandthread, big bluestem, and native bluegrasses also grow on this soil in the northern part of the survey area.

Fencing and proper location of livestock watering facilities help to control grazing of animals. Deferment of grazing may be necessary to maintain a needed balance between livestock use and forage production. In areas where the plant cover has been depleted, pitting can be used to help the native vegetation recover. Chemical control practices may be needed in disturbed areas where dense stands of pricklypear occur. Precaution must be taken to leave ample amounts of litter and forage on the soil because of the high hazard of soil blowing.

Windbreaks and environmental plantings generally are well suited to this soil. Summer fallow a year prior to planting and continued cultivation for weed control are needed to insure the establishment and survival of plantings. Trees that are best suited and have good survival are Rocky Mountain juniper, eastern redcedar, ponderosa pine, Siberian elm, Russian-olive, and hackberry. Shrubs that are best suited are skunkbush sumac, lilac, Siberian peashrub, and American plum.

This soil is well suited to wildlife habitat. It is best suited to habitat for openland and rangeland wildlife. Rangeland wildlife, such as pronghorn antelope, can be encouraged by developing livestock watering facilities, properly managing livestock grazing, and reseeding range where needed.

This soil has good potential for homesites. The main limitations are its limited ability to support a load and moderate shrink-swell potential. Roads can be designed to offset these limitations. Capability subclass VIe.

32—Fortwingate-Rock outcrop complex, 15 to 60 percent slopes. This moderately steep to steep complex is on mountains. Elevation ranges from 6,600 to 7,200 feet. The average annual precipitation is about 17 inches, and the average annual air temperature is about 44 degrees F.

The Fortwingate soil makes up about 40 percent of the complex, Rock outcrop about 30 percent, and included areas about 30 percent.

Included with this complex in mapping are areas of Paunsaugunt-Rock outcrop complex, 15 to 65 percent slopes, and Connerton-Rock outcrop complex, 8 to 90 percent slopes. Also included are some areas of soils that are similar to this Fortwingate soil but that are 10 to 20 inches deep to bedrock or are more than 40 inches deep to bedrock. There are some areas of soils that have more than 35 percent coarse fragments in the profile.

The Fortwingate soil is moderately deep and well drained. It formed in residuum derived from interbedded sandstone and shale. Slope is 15 to 40 percent. Typically,

the surface layer is reddish brown loam about 6 inches thick. The subsoil is red clay about 17 inches thick. The substratum is red, partially weathered sandstone and shale about 15 inches thick. Interbedded sandstone and shale are at a depth of 38 inches.

Permeability of the Fortwingate soil is slow. Effective rooting depth is 20 to 40 inches. Available water capacity is low. Surface runoff is medium to rapid, and the hazard of erosion is moderate. There are a few gullies throughout the complex.

Rock outcrop is in the steeper areas of the complex. It occurs throughout the mapped areas. It is mostly red sandstone.

This complex is used mainly for recreation, wildlife habitat, and some livestock grazing.

This complex is suited to the production of native vegetation suitable for grazing. Native vegetation is mainly blue grama, side-oats grama, western wheatgrass, Scribner needlegrass, and needleandthread. The dominant shrubs and trees are mountainmahogany, skunkbush sumac, and oneseed juniper. There are lesser amounts of pinyon.

Careful management of the plant cover is essential because of the difficulty of reestablishing vegetation. Proper location of livestock watering facilities helps to control grazing.

Woodland wildlife, especially mule deer, wild turkey, and blue grouse, find suitable habitat on this complex. To encourage wild turkey in areas where there is little or no water, wildlife watering facilities, such as guzzlers, can be developed. Also, ponderosa pine should be maintained. Because of the steep slopes, livestock grazing should be discouraged, which would benefit the wildlife that use these areas.

This complex is suited to the production of juniper and pinyon. It is capable of producing 4 cords per acre in a stand that averages 5 inches in diameter at a height of 1 foot. The main limitations for wood crop production are the presence of stones on the soil surface and the high hazard of erosion. Surface stones can influence felling, yarding, and other operations involving the use of equipment. Practices are needed to minimize erosion when harvesting timber. The low available water capacity may influence seedling survival.

Slope, depth to rock, and shrink-swell potential are the main limitations to the use of this complex as homesites. Special site or building designs are required because of these limitations. Special practices must be provided to minimize surface runoff and thus keep erosion to a minimum. Deep cuts, to provide essentially level building sites, can expose the bedrock. The limitation of large stones on the surface can be overcome through the use of heavy equipment when preparing building sites. Access roads must have adequate cut-slope grade and be provided with drains to control surface runoff and keep soil losses to a minimum. Deep cuts along the uphill side of the roads can expose the bedrock. Capability subclass VIIe.

33—Heldt clay loam, 0 to 3 percent slopes. This deep, well drained soil is on terraces, alluvial fans, and valley side slopes. It formed in fine textured alluvial fan sediment derived from clay shale. Most areas of this soil are in the Fountain area, but a few small areas are around Calhan. Elevation ranges from 5,200 to 6,500 feet. The average annual precipitation is about 13 inches, the average annual air temperature is about 49 degrees F, and the average frost-free period is about 145 days.

Typically, the surface layer is light brownish gray clay loam about 5 inches thick. The subsoil is light brownish gray silty clay about 36 inches thick. The substratum is light olive gray silty clay loam.

Included with this soil in mapping are small areas of Limon clay, 0 to 3 percent slopes; Manzanola clay loam, 0 to 1 percent slopes; Manzanola clay loam, 1 to 3 percent slopes; Nunn clay loam, 0 to 3 percent slopes; and Ustic Torrifluvents, loamy.

Permeability of this Heldt soil is slow. Effective rooting depth is 60 inches or more. Available water capacity is high. Surface runoff is slow, and the hazard of erosion is slight to moderate. Gullies are along some of the drainageways.

Most areas of this soil are used as native rangeland. A small acreage is in irrigated alfalfa, corn, and pasture. The corn is usually cut for silage.

Where irrigation water is available, this soil is suited to the production of corn, alfalfa, and pasture. Other suited crops are sugar beets, oats, and barley. Because of its high clay content, maintenance of organic matter content and timely tillage are needed to keep this soil workable. All crops respond to nitrogen and phosphate fertilizer where the irrigation water supply is adequate for optimum crop yields. Irrigation water is best applied to field crops by the furrow and border methods.

Where irrigation water is not available, this soil is used mostly for range. Native vegetation is mainly alkali sacaton, western wheatgrass, and galleta. There are lesser amounts of blue grama. Needleandthread, junegrass, and side-oats grama are also present where this soil occurs in the northern part of the survey area. Four-wing saltbush is a common shrub. The presence of princesplume, two-groove milkvetch, and Fremont goldenweed indicates that selenium-bearing plants are in the stand.

This soil is very difficult to revegetate, and it is especially important that livestock grazing be carefully managed. Fencing helps to control distribution of livestock. Where the plant cover has been depleted, pitting aids the recovery of the native vegetation.

Windbreaks and environmental plantings generally are not suited to this soil. Onsite investigation is needed to determine if plantings are feasible.

Openland wildlife is favored on this soil when its primary use is for crops that supply small grain, grasses, and other habitat elements needed by openland wildlife. Where water is available for irrigation, wildlife habitat, especially shrub and grass plantings, can be developed to encourage pheasant and many kinds of songbirds. In

areas of this soil near Fountain Creek, numerous habitat niches exist. If this soil is used as rangeland, scaled quail and antelope should be attracted to it; livestock grazing management is needed to encourage wildlife.

High shrink-swell potential limits use of this soil as homesites. Special site or building designs are needed to overcome this limitation. This soil is unsuited to septic tank absorption fields because of slow permeability. Capability subclasses IVe, nonirrigated, and IIIe, irrigated.

34—Holderness loam, 1 to 5 percent slopes. This deep, well drained soil formed in loamy sediment derived from arkosic beds on uplands. Elevation ranges from 7,200 to 7,400 feet. The average annual precipitation is about 18 inches, the average annual temperature is about 43 degrees F, and the average frost-free period is about 120 days.

Typically, the surface layer is grayish brown loam about 9 inches thick. The subsoil is brown clay loam about 34 inches thick. The substratum to a depth of 60 inches is light brownish gray gravelly sandy clay loam.

Included with this soil in mapping are small areas of Holderness loam, 5 to 8 percent slopes; Peyton sandy loam, 1 to 5 percent slopes; and Pring coarse sandy loam, 3 to 8 percent slopes.

Permeability of this Holderness soil is slow. Effective rooting depth is 60 inches or more. Available water capacity is high. Surface runoff is medium, and the hazard of erosion is moderate. A few gullies are along drainageways.

This soil is used mostly as rangeland. Much of this soil at one time was under dryland cultivation, but most of the cropland has been seeded back to grass; however, a small acreage is still cultivated. The main crops are wheat and oats.

This soil is well suited to the production of native vegetation suitable for grazing by cattle and sheep. Rangeland vegetation is mainly mountain muhly, little bluestem, needleandthread, Parry oatgrass, and junegrass.

Deferment of grazing in spring helps to maintain the vigor and reproduction of the cool-season bunchgrasses. Fencing and proper location of livestock watering facilities may be needed to control grazing.

This soil is suited to wildlife habitat. It is best suited to habitat for openland and rangeland wildlife. In cropland areas, habitat favorable for ring-necked pheasant, mourning dove, and many nongame species can be developed by establishing areas for nesting and escape cover. For pheasant, undisturbed nesting cover is vital and should be provided for in plans for habitat development. This is especially true in areas of intensive farming. Rangeland wildlife, such as pronghorn antelope, can be encouraged by developing livestock watering facilities, properly managing livestock grazing, and reseeding range where needed.

The main limitation of this soil for use as homesites is the shrink-swell potential. Special designs are required for buildings and roads to offset this limitation. The use of septic tank absorption fields is severely limited because of the slow permeability. Roads should be designed to minimize frost heave damage. Capability subclass IIIe.

35—Holderness loam, 5 to 8 percent slopes. This deep, well drained soil formed in loamy sediment derived from arkosic beds on uplands. Elevation ranges from 7,200 to 7,400 feet. The average annual precipitation is about 18 inches, the average annual temperature is about 43 degrees F, and the average frost-free period is about 120 days.

Typically, the surface layer is grayish brown loam about 9 inches thick. The subsoil is brown clay loam about 34 inches thick. The substratum to a depth of 10 inches is light brownish gray gravelly sandy clay loam.

Included with this soil in mapping are small areas of Holderness loam, 1 to 5 percent slopes; Holderness loam, 8 to 15 percent slopes; Peyton sandy loam, 5 to 9 percent slopes; and Pring coarse sandy loam, 3 to 8 percent slopes.

Permeability of this Holderness soil is slow. Effective rooting depth is 60 inches or more. Available water capacity is high. Surface runoff is medium, and the hazard of erosion is moderate. A few gullies are along the drainageways.

This soil is used mostly as rangeland. Much of this soil was at one time under dryland cultivation, but most of the cropland has been seeded back to grass; however, a small acreage is still cultivated. The main crops are wheat and oats.

This soil is well suited to the production of native vegetation suitable for grazing by cattle and sheep. Rangeland vegetation is mountain muhly, little bluestem, needleandthread, Parry oatgrass, and junegrass.

Deferment of grazing in spring helps to maintain the vigor and reproduction of the cool-season bunchgrasses. Fencing and proper location of livestock watering facilities may be necessary to control grazing.

This soil is suited to wildlife habitat. It is best suited to habitat for openland and rangeland wildlife. In cropland areas, habitat favorable for ring-necked pheasant, mourning dove, and many nongame species can be developed by establishing nesting and escape cover. For pheasant, undisturbed nesting cover is vital and should be provided for in plans for habitat development. This is especially true in areas of intensive farming. Rangeland wildlife, such as pronghorn antelope, can be encouraged by developing livestock watering facilities, properly managing livestock grazing, and reseeding range where needed.

The main limitation of this soil for use as homesites is the shrink-swell potential. Special designs are required for buildings and roads to offset this limitation. The use of septic tank absorption fields is severely limited because of the slow permeability. Roads should be designed to minimize frost-heave damage. Capability subclass IVe.

36—Holderness loam, 8 to 15 percent slopes. This deep, well drained soil formed in loamy sediment derived from arkosic beds on uplands. Elevation ranges from

7,200 to 7,400 feet. The average annual precipitation is about 18 inches, the average annual temperature is about 43 degrees F, and the average frost-free period is about 120 days.

Typically, the surface layer is grayish brown loam about 9 inches thick. The subsoil is brown clay loam about 34 inches thick. The substratum to a depth of 60 inches is light brownish gray gravelly sandy clay loam.

Included with this soil in mapping are small areas of Holderness loam, 5 to 8 percent slopes; Peyton sandy loam, 5 to 9 percent slopes; and Pring coarse sandy loam, 8 to 15 percent slopes.

Permeability of this Holderness soil is slow. Effective rooting depth is 60 inches or more. Available water capacity is high. Surface runoff is medium to rapid, and the hazard of erosion is moderate. In places where this soil has been cultivated, erosion is commonly severe.

This soil is well suited to the production of native vegetation suitable for grazing by cattle and sheep. Native vegetation is mainly mountain muhly, little bluestem, needleandthread, Parry oatgrass, and junegrass.

Deferment of grazing in spring helps to maintain the vigor and reproduction of the cool-season bunchgrasses. Fencing and properly locating livestock watering facilities help to control grazing.

This soil is suited to wildlife habitat. It is best suited to habitat for openland and rangeland wildlife. Rangeland wildlife, such as pronghorn antelope, can be encouraged by developing livestock watering facilities, properly managing livestock grazing, and reseeding range where needed.

The main limitations of this soil for use as homesites and for local roads are shrink-swell potential and slope. Construction of septic tank absorption fields is severely limited by the slow percolation rate of this soil. Special designs for buildings and local streets are required to overcome these limitations. Roads need to be designed to minimize damage from frost heave. Capability subclass VIe.

37—Jarre gravelly sandy loam, 1 to 8 percent slopes. This deep, well drained soil formed in alluvium derived from sandy sediment on alluvial fans or old upland terraces. Elevation ranges from 6,700 to 7,500 feet. The average annual precipitation is about 18 inches, the average annual air temperature is about 43 degrees F, and the average frost-free period is about 120 days.

Typically, the surface layer is dark grayish brown gravelly sandy loam about 5 inches thick. Coarse fragments cover 5 to 15 percent of the surface. The subsoil is brown gravelly sandy clay loam about 17 inches thick. The substratum is brown very gravelly sandy loam.

Included with this soil in mapping are small areas of Jarre-Tecolote complex, 8 to 65 percent slopes; Perrypark gravelly sandy loam, 3 to 9 percent slopes; and Pring coarse sandy loam, 3 to 8 percent slopes.

Permeability of this Jarre soil is moderate. Effective rooting depth is 60 inches or more. Available water capacity is moderate. Surface runoff is medium to slow, and the hazard of erosion is moderate.

This soil is used as rangeland and for recreation, wildlife habitat, and homesites.

This soil is well suited to the production of native vegetation suitable for grazing by cattle and sheep. Native vegetation is mountain muhly, little bluestem, needleandthread, Parry oatgrass, and junegrass.

Deferment of grazing in spring helps to maintain the vigor and reproduction of the cool-season bunchgrasses. Fencing and properly locating livestock watering facilities help to control grazing.

Windbreaks and environmental plantings are suited to this soil. Available water capacity is the main limitation for the establishment of tree and shrub plantings. Summer fallow a year in advance and continued cultivation for weed control are needed to insure the establishment and survival of plantings. Supplemental irrigation may also be needed to insure survival. Trees that are best suited and have good survival are Rocky Mountain juniper, eastern redcedar, ponderosa pine, and Siberian elm. Shrubs that are best suited are skunkbush sumac and lilac.

This soil is suited to wildlife habitat. It is best suited to habitat for openland and rangeland wildlife. Rangeland wildlife, such as pronghorn antelope, can be encouraged by developing livestock watering facilities, properly managing livestock grazing, and reseeding range where needed.

This soil has good potential for use as homesites. Its main limitations are frost-action potential and shrink-swell potential. Special designs for roads and streets are needed because of these limitations. A surface dressing of topsoil is desirable where the very gravelly subsoil is exposed during site preparation. Capability subclass IVe.

38—Jarre-Tecolote complex, 8 to 65 percent slopes. These moderately sloping to very steep soils are on alluvial fans. Elevation ranges from 6,700 to 7,500 feet. The average annual precipitation is about 18 inches, and the average annual air temperature is about 43 degrees F.

The Jarre soil makes up about 40 percent of the complex, the Tecolote soil about 30 percent, and other soils about 30 percent.

Included with this complex in mapping are areas of Jarre gravelly sandy loam, 1 to 8 percent slopes; Kettle gravelly loamy sand, 8 to 40 percent slopes; Kutch clay loam, 5 to 20 percent slopes; and Chaseville gravelly sandy loam, 8 to 40 percent slopes.

The Jarre soil is deep and well drained. It formed in alluvium derived from sandy sediment. It has slopes of 1 to 30 percent. Typically, the surface layer is dark grayish brown gravelly sandy loam about 5 inches thick. Coarse fragments on the surface range from 5 to 15 percent. The subsoil is brown gravelly sandy clay loam about 17 inches thick. The substratum to a depth of 60 inches is brown very gravelly sandy loam.

Permeability of the Jarre soil is moderate. Effective rooting depth is 60 inches or more. Available water capacity is moderate. Surface runoff is medium to rapid, and the hazard of erosion is moderate to high. Typically,

this complex has a large amount of cobbles and stones on the surface, and in some areas there are large boulders.

The Tecolote soil is deep and well drained. It formed in alluvial fan sediment derived from acid igneous rock. Cobbles and stones on the surface range from about 30 to 50 percent. Typically, the surface layer is dark brown very stony loam about 3 inches thick. The subsurface layer is pinkish gray very gravelly loamy sand about 9 inches thick. The subsoil is reddish brown extremely gravelly sandy clay loam about 33 inches thick. The substratum to a depth of 60 inches or more is light brown extremely gravelly loamy sand.

Permeability of the Tecolote soil is moderate. Effective rooting depth is 40 inches or more. Available water capacity is low to moderate. Surface runoff is medium, and the hazard of erosion is moderate.

The soils in this complex are used for woodland, rangeland, recreation, wildlife habitat, and homesites.

The Jarre soil is well suited to the production of native vegetation suitable for grazing by cattle and sheep. Rangeland vegetation is mainly mountain muhly, little bluestem, needleandthread, Parry oatgrass, and junegrass.

Deferment of grazing in spring helps to maintain vigor and production of the cool-season bunchgrasses on the Jarre soil. Fencing and properly locating livestock watering facilities help to control grazing.

The Tecolote soil is suited to the production of Douglas-fir. It is capable of producing about 2,240 cubic feet, or 4,900 board feet (International rule), of merchantable timber per acre from a fully stocked, even-aged stand of 80-year-old trees. The main limitations for timber production are slope and hazard of erosion. Special attention must be given to keep erosion to a minimum when harvesting.

Windbreaks and environmental plantings are suited to the Jarre soil. Available water capacity is the main limitation for the establishment of tree and shrub plantings. Summer fallow a year in advance and continued cultivation for weed control are needed to insure survival. Trees that are best suited and have good survival are Rocky Mountain juniper, eastern redcedar, ponderosa pine, and Siberian elm. Shrubs that are best suited are skunkbush sumac and lilac.

The Jarre soil is best suited to habitat for openland and rangeland wildlife. Rangeland wildlife, such as pronghorn antelope, can be encouraged by developing livestock watering facilities, properly managing livestock grazing, and reseeding range where needed.

The Tecolote soil is best suited to woodland wildlife, especially mule deer, wild turkey, and blue grouse. To encourage wild turkey in areas where there is little or no water, wildlife watering facilities, such as guzzlers, can be developed. Because of the steep slopes, livestock grazing should be discouraged, which would benefit the wildlife that use these areas.

The main limitations for urban development on the Jarre soil are slope, shrink-swell potential, and moderate frost action potential. Special site or building designs are required because of the slope and shrink-swell potential. Designs to overcome the limitations of slope, shrink-swell potential, and moderate frost-action potential are also required for roads and streets. Practices must be provided to minimize surface runoff and erosion.

The main limitations for urban development on the Tecolote soil are steep slopes and the presence of stones. The presence of stones can cause problems when excavating for installation of underground utilities. Heavy equipment can be used to move the stones when preparing building sites or when constructing roads. Plans for homesite development should provide for the preservation of as many trees as possible to maintain the esthetic value of the sites. Capability subclass VIIe.

39—Keith silt loam, 0 to 3 percent slopes. This deep, well drained soil formed in silty eolian material on uplands. Elevation ranges from 5,500 to 5,800 feet. The average annual precipitation is about 13 inches, the average annual air temperature is about 49 degrees F, and the average frost-free period is about 145 days.

Typically, the surface layer is brown silt loam about 8 inches thick. The subsoil is brown or grayish brown silty clay loam about 22 inches thick. The substratum to a depth of 60 inches or more is pale brown silt loam.

Included with this soil in mapping are small areas of Ascalon sandy loam, 1 to 3 percent slopes; Fort Collins loam, 0 to 3 percent slopes; Stoneham sandy loam, 3 to 8 percent slopes; and Wiley silt loam, 1 to 3 percent slopes.

Permeability of this Keith soil is moderate. Effective rooting depth is 60 inches or more. Available water capacity is high. Surface runoff is slow, and the hazard of erosion is moderate.

Until recently about 12 percent of this soil was used for irrigated cropland. Urbanization is rapidly taking this acreage out of farm production. A small acreage of this soil is used for nonirrigated crops. Wheat, sudangrass, and forage sorghums are the main crops.

If this soil is irrigated, it is well suited to small grain, field corn, alfalfa, sugar beets, and specialty crops such as asparagus and sweet corn. Hardy varieties of apples have also been grown successfully on this soil. Irrigation water management, land leveling, and maintenance of organic matter content are the main management practices needed on this soil. This soil is limited for nonirrigated crops because of low average annual precipitation and a hazard of soil blowing.

This soil is well suited to the production of native vegetation suitable for grazing. Rangeland vegetation is blue grama, western wheatgrass, side-oats grama, dropseed, and galleta. Production varies from year to year, depending on the amount of precipitation received.

Fencing and properly locating livestock watering facilities help to control grazing. Deferment of grazing may be necessary to maintain the proper balance between livestock use and forage production. In areas where the plant cover has been depleted, pitting can be used to help the natural vegetation recover. Chemical control may be needed in disturbed areas where dense stands of

pricklypear occur. Ample amounts of litter and forage should be left on the soil because of the high hazard of soil blowing.

Windbreaks and environmental plantings are generally well suited to this soil. Summer fallow a year prior to planting and continued cultivation for weed control are needed to insure establishment and survival of plantings. Trees that are best suited and have good survival are Rocky Mountain juniper, eastern redcedar, ponderosa pine, Siberian elm, Russian-olive, and hackberry. Shrubs that are best suited are skunkbush sumac, lilac, Siberian peashrub, and American plum.

Depending on land use, this soil can produce habitat that is suitable for either rangeland wildlife, such as antelope, or for openland wildlife, such as pheasant, cottontail, and mourning dove. Availability of irrigation water largely determines the land use. Where no irrigation water is available, this soil is mainly used as rangeland, a use that favors rangeland wildlife. If this soil is used as rangeland, fences, livestock water developments, and proper livestock grazing use are practices that enhance habitat for rangeland wildlife. Production of crops such as wheat, corn, and alfalfa provides suitable habitat for openland wildlife, especially pheasant. Among the practices that increase openland wildlife populations are planting trees and shrubs and providing undisturbed nesting cover.

The main limitation of this soil for urban use is shrink-swell potential. Buildings and roads need to be designed to overcome this limitation. Roads need to be designed to minimize frost-heave damage. Capability subclasses IVe, nonirrigated, and IIe, irrigated.

40—Kettle gravelly loamy sand, 3 to 8 percent slopes. This deep, well drained soil formed in sandy arkosic deposits on uplands. Elevation ranges from 7,000 to 7,700 feet. The average annual precipitation is about 18 inches, the average annual air temperature is about 43 degrees F, and the average frost-free period is about 120 days.

Typically, the surface layer is gray gravelly loamy sand about 3 inches thick. The subsurface layer is light gray gravelly loamy sand about 13 inches thick. The subsoil is very pale brown gravelly sandy loam about 24 inches thick. It consists of a matrix of loamy coarse sand that has thin bands of coarse sandy loam or sandy clay loam. The substratum to a depth of 60 inches or more is light yellowish brown extremely gravelly loamy sand.

Included with this soil in mapping are small areas of Alamosa loam, 1 to 3 percent slopes; Elbeth sandy loam, 3 to 8 percent slopes; Pring coarse sandy loam, 3 to 8 percent slopes; Tomah-Crowfoot loamy sands, 3 to 8 percent slopes; and a few rock outcrops.

Permeability of this Kettle soil is rapid. Effective rooting depth is 60 inches or more. Available water capacity is low to moderate. Surface runoff is slow, and the hazard of erosion is slight to moderate. A few gullies have formed in drainageways.

This soil is used for woodland, livestock grazing, wildlife habitat, recreation, and homesites.

This soil is suited to the production of ponderosa pine. It is capable of producing about 2,240 cubic feet or 4,900 board feet (International rule), of merchantable timber per acre from a fully stocked, even-aged stand of 80-year-old trees. The main limitation for the production or harvesting of timber is the low available water capacity. The low available water capacity also influences seedling survival, especially in areas where understory plants are plentiful. Erosion must be kept to a minimum when harvesting timber.

This soil has good potential for mule deer, tree squirrels, cottontail rabbit, and wild turkey. These animals obtain their food and shelter from pine trees, shrubs, and ground cover, which provide browse, forbs, fruit, and seeds. The presence of ponderosa pine and Gambel oak should encourage wild turkey populations; however, where water is not naturally present, wildlife watering facilities must be provided to attract and maintain wild turkey and other wildlife species. Livestock grazing management is vital on this soil if wildlife populations are to be maintained.

This soil has good potential for use as homesites. Plans for homesite development on this soil should provide for the preservation of as many trees as possible in order to maintain the esthetic value of the sites. During seasons of low precipitation, fire may become a hazard to homesites. This hazard can be minimized by installing firebreaks and reducing the amount of litter on the forest floor. Capability subclass VIe.

41—Kettle gravelly loamy sand, 8 to 40 percent slopes. This deep, well drained soil formed in sandy arkosic deposits on uplands. Elevation ranges from 7,000 to 7,700 feet. The average annual precipitation is about 18 inches, the average annual air temperature is about 43 degrees F, and the average frost-free period is about 120 days.

Typically, the surface layer is gray gravelly loamy sand about 3 inches thick. The subsurface layer is light gray gravelly loamy sand about 13 inches thick. The subsoil is very pale brown gravelly sandy loam about 24 inches thick. It consists of a matrix of loamy coarse sand that has thin bands of coarse sandy loam or sandy clay loam. The substratum to a depth of 60 inches or more is light yellowish brown extremely gravelly loamy sand.

Included with this soil in mapping are small areas of Elbeth sandy loam, 8 to 15 percent slopes; Pring coarse sandy loam, 8 to 15 percent slopes; Tomah-Crowfoot loamy sands, 8 to 15 percent slopes; and a few rock outcrops.

Permeability of this Kettle soil is rapid. Effective rooting depth is 60 inches or more. Available water capacity is low to moderate. Surface runoff is medium, and the hazard of erosion is moderate. Some gullies have formed in drainageways.

The soil is used for woodland, livestock grazing, wildlife habitat, recreation, and homesites.

This soil is suited to the production of ponderosa pine. It is capable of producing 2,240 cubic feet, or 4,900 board

feet (International rule), of merchantable timber per acre from a fully stocked, even-aged stand of 80-year-old trees. The main limitation for this use is the moderate hazard of erosion. Measures must be taken to reduce erosion when harvesting timber, especially on the steeper slopes. The low to moderate available water capacity also influences seedling survival, especially in areas where understory plants are plentiful.

This soil has good potential for mule deer, tree squirrel, cottontail, and wild turkey. These animals obtain their food and shelter from pine trees, shrubs, and ground cover, which provide browse, forbs, fruit, and seeds. The presence of ponderosa pine and Gambel oak should encourage wild turkey populations; however, where water is not naturally present, wildlife watering facilities must be provided to attract and maintain wild turkey and other wildlife species. Livestock grazing management is vital on this soil if wildlife populations are to be maintained.

The moderately sloping to steep slopes limit the suitability of this soil for homesites. Special practices must be provided to minimize surface runoff and thus keep erosion to a minimum. This soil requires special site or building designs because of the slope. Deep cuts, to provide essentially level building sites, may expose bedrock. Access roads must be designed to provide adequate cut-slope grade, and drains must be used to control surface runoff and keep soil losses to a minimum. During seasons of low precipitation, fire may become a hazard to homesites. This hazard can be minimized by installing firebreaks and reducing the amount of litter on the forest floor. Capability subclass VIe.

42—**Kettle-Rock outcrop complex.** This gently rolling to very steep complex, is mostly on the side slopes of uplands. Slopes range from 8 to 60 percent. Elevation ranges from 6,800 to 7,700 feet. The average annual precipitation is about 18 inches, and average annual air temperature is about 43 degrees F.

The Kettle soil makes up about 60 percent of the complex, Rock outcrop about 20 percent, and other soils about 20 percent.

Included with this complex in mapping are areas of Peyton-Pring complex, 8 to 15 percent slopes; Elbeth sandy loam, 8 to 15 percent slopes; and Elbeth-Pring complex, 5 to 50 percent slopes.

The Kettle soil is deep and well drained. It formed in sandy arkosic deposits, mostly on the lower slopes of the complex. Slope is commonly less than 20 percent. Typically, the surface layer is gray, medium acid or slightly acid gravelly loamy sand about 3 inches thick. The subsurface layer is light gray, medium acid gravelly loamy sand about 13 inches thick. The subsoil is very pale brown, medium acid or slightly acid gravelly sandy loam about 24 inches thick. It consists of loamy coarse sand that has thin bands of coarse sandy loam or sandy clay loam. The substratum to a depth of 60 inches or more is light yellowish brown extremely gravelly loamy sand.

Permeability of the Kettle soil is rapid. Effective rooting depth is more than 60 inches. Available water capacity is low to moderate. Surface runoff is medium to rapid, and the hazard of erosion is slight to high. Soil slippage and deep gullies are common.

Rock outcrop is mostly in the form of vertical cliffs. Large stones are common on the lower slopes of this complex.

This complex is suited to the production of ponderosa pine. It is capable of producing 2,240 cubic feet, or 4,900 board feet (International rule), of merchantable timber per acre from a fully stocked, even-aged stand of 80-year-old trees. The main limitation of this complex for this use is the presence of Rock outcrop and the moderate hazard of erosion on the Kettle soil. Measures must be taken to minimize erosion when harvesting timber, especially on the steeper slopes. The low to moderate available water capacity also influences seedling survival, especially where understory plants are plentiful.

This complex has good potential for producing habitat for mule deer, tree squirrels, cottontail, and wild turkey. These animals obtain their food and shelter from pine trees, shrubs, and ground cover, which provide browse, forbs, fruit, and seeds. The presence of ponderosa pine and Gambel oak should encourage wild turkey populations; however, where water is not naturally present, wildlife watering facilities must be provided to attract and maintain wild turkey and other wildlife species. Livestock grazing management is vital on this soil if wildlife populations are to be maintained.

The moderate to very steep slopes limit the potential of this complex for homesites. Special practices must be provided to minimize surface runoff and thus keep erosion to a minimum. Special site or building designs are required because of the slope. Deep cuts, to provide essentially level building sites, can expose bedrock. The limitation of large stones on the soil surface can be overcome through the use of heavy equipment when preparing building sites. Access roads must be designed to provide adequate cut-slope grade, and drains must be used to control surface runoff and thus keep soil losses to a minimum. Deep cuts along the uphill side of the roads can expose the bedrock. Capability subclass VIIe.

43—**Kim loam, 1 to 8 percent slopes.** This deep, well drained soil formed in calcareous loamy sediment on fans and uplands. Elevation ranges from 5,300 to 5,600. The average annual precipitation is about 13 inches, the average annual temperature is about 49 degrees F, and the average frost-free period is about 145 days.

Typically, the surface layer is brown loam about 4 inches thick. The substratum is very pale brown loam to a depth of 60 inches or more.

Included with this soil in mapping are small areas of Fort Collins loam, 3 to 8 percent slopes; Midway clay loam, 3 to 25 percent slopes, and Wiley silt loam, 3 to 9 percent slopes.

Permeability of this Kim soil is moderate. Effective rooting depth is 60 inches or more. Available water capacity is high. Surface runoff is medium, and the hazard of erosion is moderate.

Almost all areas of this soil are used as rangeland.

This soil is well suited to the production of native vegetation suitable for grazing. Native vegetation is mainly blue grama, western wheatgrass, side-oats grama, sand dropseed, and galleta.

Fencing and properly locating livestock watering facilities help to control grazing. Deferment of grazing may be necessary to maintain a needed balance between livestock use and forage production. In areas where the plant cover has been depleted, pitting can be used to help the natural vegetation recover. Chemical control may be needed in disturbed areas where dense stands of pricklypear occur. Ample amounts of litter and forage should be left on the soil because of the high hazard of soil blowing.

Windbreaks and environmental plantings generally are well suited to this soil. Summer fallow a year prior to planting and continued cultivation for weed control are needed to insure establishment and survival of plantings. Trees that are best suited and have good survival are Rocky Mountain juniper, eastern redcedar, ponderosa pine, Siberian elm, Russian-olive, and hackberry. Shrubs that are best suited are skunkbush sumac, lilac, Siberian peashrub, and American plum.

This soil is suited to wildlife habitat. It is best suited to habitat for openland and rangeland wildlife. Rangeland wildlife, such as pronghorn antelope, can be encouraged by developing livestock watering facilities, properly managing livestock grazing, and reseeding range where needed.

The main limitation of this soil for urban development is its limited ability to support a load. Dwellings, roads, and streets can be designed to overcome this limitation. Capability subclass VIe.

44—Kutch clay loam, 3 to 5 percent slopes. This moderately deep, well drained soil formed in calcareous clay on uplands. Elevation ranges from about 6,300 to 6,800 feet. The average annual precipitation is about 15 inches, the average annual temperature is about 47 degrees F, and the frost-free period is about 135 days.

Typically, the surface layer is grayish brown clay loam about 5 inches thick. The subsoil is brown and grayish brown heavy clay loam about 23 inches thick. The substratum is light gray extremely shaly clay loam about 8 inches thick over shale.

Included with this soil in mapping are small areas of Bresser sandy loam, 3 to 5 percent slopes; Cushman loam, 1 to 5 percent slopes; and Truckton sandy loam, 3 to 9 percent slopes.

Permeability of this Kutch soil is slow. Effective rooting depth ranges from 20 to 40 inches, depending on depth to shale. Available water capacity is moderate. Surface runoff is medium, and the hazard of erosion is slight to moderate. Some gullying has taken place along drainageways.

About 80 percent of the acreage of this soil is used for grazing livestock. The remaining acreage is used mainly for dryland wheat, but barley is grown in some areas. Summer fallow is a common practice. Crop residue management and minimum tillage help to control erosion.

This soil is suited to permanent grass pasture. A suitable pasture planting is intermediate or pubescent wheatgrass.

This soil is suited to the production of native vegetation suitable for grazing. Native vegetation is mainly western wheatgrass, blue grama, needleandthread, and side-oats grama. The presence of princesplume, two-groove milkvetch, and Fremont goldenweed indicates that selenium-bearing plants are in the stand.

Good grazing management is essential to maintain desirable grasses. Deferment of grazing early in spring helps to maintain the health and vigor of cool-season grasses. Proper location of livestock watering facilities helps to control grazing.

Windbreaks and environmental plantings generally are not suited to this soil. Onsite investigation is needed to determine if plantings are feasible.

Rangeland wildlife, such as antelope, cottontail, coyote, and scaled quail, is best adapted for life on this droughty soil. Forage production is typically low, and proper livestock grazing management is necessary if wildlife and livestock share the range. Livestock watering developments are also important, and they are used by various wildlife species.

The main limitations of this soil for urban use are the depth to shale, slow permeability, and high shrink-swell potential. Septic tank absorption fields do not function properly because of the slow permeability and limited depth to shale. Special designs for buildings, roads, and streets are needed to overcome the limitations of high shrink-swell potential and limited depth to shale. Capability subclass IVe.

45—Kutch clay loam, 5 to 20 percent slopes. This moderately deep, well drained soil formed in calcareous clay over shale on uplands. Elevation ranges from about 6,300 to 6,800 feet. The average annual precipitation is about 15 inches, the average annual temperature is about 47 degrees F, and the frost-free period is about 135 days.

Typically, the surface layer is grayish brown clay loam about 5 inches thick. The subsoil is brown and grayish brown heavy clay loam about 23 inches thick. The substratum is light gray extremely shaly clay loam about 8 inches thick over shale.

Included with this soil in mapping are small areas of Bresser sandy loam, 5 to 9 percent slopes; Cushman loam, 5 to 15 percent slopes; and Truckton sandy loam, 3 to 9 percent slopes.

Permeability of this Kutch soil is slow. Effective rooting depth ranges from 20 to 40 inches, depending on depth to shale. Available water capacity is moderate. Surface runoff is medium to rapid, and the hazard of erosion is moderate. Some gullies have formed along drainageways.

Almost all areas of this soil are used for range.

This soil is suited to the production of native vegetation suitable for grazing. Native vegetation is mainly western wheatgrass, blue grama, needleandthread, and side-oats grama. The presence of princesplume, two-groove milk-

vetch, and Fremont goldenweed indicates that selenium-bearing plants are in the stand.

Good grazing management is essential to maintain the desirable grasses. Deferment of grazing early in spring helps to maintain the health and vigor of cool-season grasses. Properly locating livestock watering facilities helps to control grazing.

Windbreaks and environmental plantings are generally not suited to this soil. Onsite investigation is needed to determine if plantings are feasible.

Rangeland wildlife, such as antelope, cottontail, coyote, and scaled quail, is best adapted for life on this droughty soil. Forage production is typically low, and proper livestock grazing management is necessary if wildlife and livestock share the range. Livestock watering developments are also important, and they are used by various wildlife species.

The main limitations of this soil for urban use are the moderate depth to shale, slow permeability, high shrink-swell potential, and slope. Community sewerage systems are needed because septic tank absorption fields do not function properly because of the depth to shale and slow permeability. Special designs for buildings, roads, and streets are needed to overcome the limitations of high shrink-swell potential, limited depth to shale, and slope. Capability subclass VIe.

46—Kutler-Broadmoor-Rock outcrop complex, 25 to 90 percent slopes. This moderately steep and extremely steep complex is on mountains (fig. 2). Elevation ranges mainly from 7,000 to 8,500 feet. The average annual precipitation is about 20 inches, and the average annual temperature is about 42 degrees F.

The Kutler soil makes up about 35 percent of the complex, the Broadmoor soil about 30 percent, and Rock outcrop about 30 percent. About 5 percent of the complex is soils that are similar to the Kutler and Broadmoor soils but that are less than 20 inches deep to hard granite bedrock. A small area of this complex is at an elevation of as much as about 9,800 feet and has colder temperatures than are typical for the Broadmoor and Kutler soils.

The Kutler soil is moderately deep and somewhat excessively drained. It formed in material weathered from granite bedrock. Slope is 25 to 65 percent. Typically, the surface layer is brown very gravelly sandy loam about 6 inches thick. The substratum, about 17 inches thick, is brown very gravelly sandy loam in the upper part and grades to extremely gravelly sandy loam in the lower part. It is underlain by highly weathered granite.

Permeability of the Kutler soil is rapid. Effective rooting depth ranges from 20 to 40 inches. Available water capacity is low. Surface runoff is rapid, and the hazard of erosion is high. Soil slippage is common.

The Broadmoor soil is moderately deep and somewhat excessively drained. It formed in residuum derived from fractured granite. Slope is 25 to 70 percent. The surface layer is grayish brown extremely gravelly sandy loam about 15 inches thick. The subsoil is brown extremely gravelly sandy loam about 13 inches thick over highly weathered granite.

Permeability of the Broadmoor soil is rapid. Effective rooting depth is 20 to 40 inches. Available water capacity is low. Surface runoff is rapid, and the hazard of erosion is moderate to high. Soil slippage is common.

Rock outcrop is Pikes Peak granite and other acid igneous rocks. It occurs throughout the complex.

The soils in this complex are used for woodland, range, recreation, and wildlife habitat.

The Kutler soil is well suited to the production of native vegetation suitable for grazing by cattle and sheep. Native vegetation is mainly mountain muhly, Arizona fescue, little bluestem, needleandthread, and Parry oatgrass.

Deferment of grazing in spring helps to maintain the vigor and reproduction of the cool-season bunchgrasses. Fencing and properly locating livestock watering facilities help to control grazing.

The Broadmoor soil is suited to the production of Douglas-fir. It is capable of producing about 4,100 cubic feet, or 15,000 board feet (International rule), of merchantable timber per acre from a fully stocked, even-aged stand of 80-year-old trees. The main limitations for its use for timber production are slope and the hazard of erosion. Measures must be taken to minimize erosion when harvesting timber.

Rangeland wildlife, such as antelope, cottontail, coyote, and scaled quail, is best adapted for life on the droughty Kutler soil. Forage production is typically low, and proper livestock grazing management is necessary if wildlife and livestock share the range. Livestock watering developments are also important, and they are used by various wildlife species.

Wildlife populations on the Broadmoor soil are minimal because of the dense stands of trees. Openings could be created in the overstory canopy to allow for production of various browse species, but this practice must be used with caution because of the steep slopes.

The main limitations for the use of these soils for urban development are depth to rock and slope. Measures must be taken to minimize surface runoff and thus keep erosion to a minimum. These soils also require special site or building designs because of the slope. Deep cuts, to provide essentially level building sites, can expose the bedrock. The limitation of large stones on the surface can generally be overcome by the use of heavy equipment when preparing building sites. Access roads must have adequate cut-slope grade and be provided with drains to control surface runoff and keep soil losses to a minimum. Capability subclass VIIe.

47—Limon clay, 0 to 3 percent slopes. This deep, well drained soil formed in calcareous clayey alluvium on alluvial fans and flood plains. Elevation ranges from 5,200 to 6,200 feet. The average annual precipitation is about 13 inches, the average annual temperature is about 49 degrees F, and the frost-free period is about 145 days.

Typically, the surface layer is light gray clay about 4 inches thick. The substratum is light gray silty clay in the upper 8 inches, and it grades to light gray silty clay loam that extends to a depth of 60 inches or more.

Included with this soil in mapping are small areas of Heldt clay loam, 0 to 3 percent slopes; Manzanola clay loam, 0 to 1 percent slopes; Manzanola clay loam, 1 to 3 percent slopes; and Ustic Torrifluvents, loamy.

Permeability of this Limon soil is slow. Effective rooting depth is 60 inches or more. Available water capacity is high. Surface runoff is slow, and the hazard of erosion is moderate. Some gullying is present.

About 25 percent of the acreage of this soil is used for irrigated crops. The main crops are alfalfa hay and pasture. The remaining acreage of this soil is used for range.

In addition to alfalfa hay and pasture, corn, sorghums, barley, and sugar beets are also suited to this soil. Timely tillage, use of deep-rooted crops, irrigation water management, and use of crop residue or green manure crops help to keep the soil in good tilth.

There is no significant use of this soil for nonirrigated crops. Some areas are suited to native hay production.

Native vegetation is mainly saltgrass, alkali sacaton, western wheatgrass, blue grama, and fourwing saltbush. Big bluestem, switchgrass, and junegrass also are present where this soil occurs in the northern part of the survey area.

This soil is generally difficult to revegetate, and it is therefore especially important that livestock grazing be carefully managed. Fencing and properly locating livestock watering facilities help to control grazing. Occasional rest from grazing during the growing season favors the main forage species. Chiseling or pitting improves plant cover where it has been depleted and is in poor or fair condition. Control of greasewood or rabbitbrush is sometimes needed where these shrubs have increased to the point where they interfere with the production of forage and the distribution of grazing.

Windbreak and environmental plantings generally are not suited to this soil. Onsite investigation is needed to determine if plantings are feasible.

Rangeland wildlife, such as antelope, cottontail, coyote, and scaled quail, is best adapted for life on this droughty soil. Forage production is typically low, and proper livestock grazing management is necessary if wildlife and livestock share the range. Livestock watering developments are also important, and they are used by various wildlife species.

Where this soil is under irrigation, openland wildlife can be encouraged if food and cover are provided through various means of wildlife habitat development.

The main limitations of this soil for urban use are slow permeability and high shrink-swell potential. This soil is also subject to periodic flooding. It is poorly suited for building sites. Capability subclasses IVe, nonirrigated, and IIIe, irrigated.

48—Louviers silty clay loam, 3 to 18 percent slopes. This shallow, well drained soil formed in noncalcareous clayey alluvium on uplands. Elevation ranges from about 6,200 to 7,000 feet. The average annual precipitation is about 15 inches, the average annual air temperature is about 47 degrees F, and the average frost-free period is about 135 days.

Typically, the surface layer is grayish brown silty clay loam about 5 inches thick. The underlying material is about 9 inches thick. It is grayish brown silty clay in the upper part and grades to dark grayish brown silty clay loam in the lower part. Shale is at a depth of about 14 inches.

Included with this soil in mapping are small areas of Bresser sandy loam, 3 to 5 percent slopes; Columbine gravelly sandy loam, 0 to 3 percent slopes; Stapleton sandy loam, 3 to 8 percent slopes; and Stapleton sandy loam, 8 to 15 percent slopes.

Permeability of this Louviers soil is slow. Effective rooting depth is 10 to 20 inches. Available water capacity is low. Surface runoff is medium to rapid, and the hazard of erosion is moderate to high. A few gullies have formed along drainageways and trails.

This soil is used as rangeland.

Native vegetation is mainly western wheatgrass, blue grama, needleandthread, and side-oats grama. The presence of princesplume, two-groove milkvetch, and Fremont goldenweed indicates that selenium-bearing plants are in the stand.

Good grazing management is essential to maintain the desirable grasses. Deferment of grazing early in spring helps to maintain the health and vigor of cool-season grasses. Proper location of livestock watering facilities helps to control grazing.

Windbreak and environmental plantings are generally not suited to this soil. Onsite investigation is needed to determine if plantings are feasible.

Rangeland wildlife, such as antelope, cottontail, coyote, and scaled quail, is best adapted for life on this droughty soil. Forage production is typically low, and proper livestock grazing management is necessary if wildlife and livestock share the range. Livestock watering developments are also important, and they are used by various wildlife species.

The main limitations of this soil for homesites or urban uses are shallow depth to shale, high shrink-swell potential, and slope. Special site or building designs are needed to overcome these limitations. Septic tank absorption fields do not function properly because of these limitations. Capability subclass VIe.

49—Louviers cobbly clay loam, 5 to 40 percent slopes. This shallow, well drained soil formed in noncalcareous clayey alluvium on isolated knobs, ridges, and terrace breaks in the vicinity of Calhan (fig. 3). Elevation ranges from 6,500 to 7,000 feet. The average annual precipitation is about 15 inches, the average annual air temperature is about 47 degrees F, and the frost-free period is about 135 days.

Typically, the surface layer is grayish brown cobbly silty clay loam about 5 inches thick. About 35 percent cobbles and stones is on the surface and in the upper part of the surface layer. The substratum is grayish brown silty clay in the upper part and grades to dark grayish brown

silty clay loam in the lower part. Shale is at a depth of about 14 inches.

Included with this soil in mapping are small areas of Bresser, Cushman, and Kutch soils. Also included are beds of kaolinitic clay and shale that occur as outcrops or are at a depth of less than 20 inches. These beds are red, pink, lavender, buff, yellow, and white, and they are locally referred to as paint pots or paint mines.

Permeability of this Louviers soil is slow. Effective rooting depth is 10 to 20 inches. Available water capacity is low. Surface runoff is rapid, and the hazard of erosion is moderate to severe. In places shale beds are exposed in wide, deep gullies.

Most areas of this soil are used as rangeland. This soil is a source of clay used for the manufacture of brick and tile.

Native vegetation is mainly western wheatgrass, blue grama, alkali sacaton, needleandthread, and side-oats grama. The presence of princesplume, two-groove milkvetch, and Fremont goldenweed indicates that selenium-bearing plants are in the stand.

Good grazing management is essential to maintain the desirable grasses. Deferment of grazing early in spring helps to maintain the health and vigor of cool-season grasses. Proper location of livestock water facilities helps to control grazing.

Windbreak and environmental plantings are generally not suited to this soil. Onsite investigation is needed to determine if plantings are feasible.

Rangeland wildlife, such as antelope, cottontail, coyote, and scaled quail, is best adapted for life on this droughty soil. Forage production is typically low, and proper livestock grazing management is necessary if wildlife and livestock share the range. Livestock watering developments are also important, and they are used by various wildlife species.

The main limitations of this soil for homesites or urban development are shallow depth to shale, cobbles and stones, shrink-swell potential, and slope. Dwellings and roads need to be designed to overcome these limitations. Roads constructed on the steep slopes must have adequate cut-slope grade and be provided with drains to control surface runoff. Septic tank absorption fields do not function properly because of the shallow depth to shale and the steep slopes. Capability subclass VIIe.

50—Manvel loam, 3 to 9 percent slopes. This deep, well drained soil formed in calcareous loamy alluvium on valley side slopes, on fans, and on uplands. Elevation ranges from 5,800 to 6,300 feet. The average annual precipitation is about 13 inches, the average annual air temperature is about 49 degrees F, and the average frost-free period is about 145 days.

Typically, the surface layer is grayish brown loam about 3 inches thick. The substratum is light brownish gray and pale brown loam that extends to a depth of 60 inches or more.

Included with this soil in mapping are small areas of Kim loam, 1 to 8 percent slopes; Midway clay loam, 3 to 25 percent slopes; Penrose-Manvel complex, 3 to 45 percent slopes; and Stoneham sandy loam, 8 to 15 percent slopes.

Permeability of this Manvel soil is moderate. Effective rooting depth is 60 inches or more. Available water capacity is high. Surface runoff is medium, and the hazards of erosion and soil blowing are moderate.

Most areas of this soil are used as rangeland and for military maneuvers.

This soil is well suited to the production of native vegetation suitable for grazing. Vegetation is mainly blue grama, western wheatgrass, side-oats grama, sand dropseed, and galleta. Production varies from year to year, depending on the amount of precipitation.

Fencing and properly locating livestock watering facilities help to control grazing. Deferment of grazing may be necessary to maintain a needed balance between livestock use and forage production. In areas where the plant cover has been depleted, pitting can be used to help the native vegetation recover. Chemical plant control may be needed in disturbed areas where dense stands of pricklypear occur. Ample amounts of litter and forage should be left on the soil because of the high soil blowing hazard.

Windbreaks and environmental plantings are generally well suited to this soil. Summer fallow a year prior to planting and continued cultivation for weed control are needed to insure the establishment and survival of plantings. Trees that are best suited and have good survival are Rocky Mountain juniper, eastern redcedar, ponderosa pine, Siberian elm, Russian-olive, and hackberry. Shrubs that are best suited are skunkbush sumac, lilac, Siberian peashrub, and American plum.

Rangeland wildlife, such as antelope, cottontail, coyote, and scaled quail, is best adapted for life on this droughty soil. Forage production is typically low, and proper livestock grazing management is necessary if wildlife and livestock share the range. Livestock watering developments are also important, and they are used by various wildlife species.

This soil has fair potential for homesites. Its main limitations for buildings and roads are moderate shrink-swell potential and low bearing strength. Special practices must be provided to reduce surface runoff and thus keep soil erosion to a minimum. Special designs for buildings and roads are needed to overcome the soil limitations. Capability subclass VIe.

51—Manzanola clay loam, 0 to 1 percent slopes. This deep, well drained soil formed in calcareous loamy alluvium on fans and terraces. Elevation ranges from about 5,200 to 6,000 feet. The average annual precipitation is about 13 inches, the average annual air temperature is about 49 degrees F, and the average frost-free period is about 145 days.

Typically, the surface layer is grayish brown clay loam about 6 inches thick. The subsoil is grayish brown heavy clay loam about 26 inches thick. The substratum is grayish brown clay loam to a depth of 60 inches or more. The lower part of the subsoil and the substratum contain visible soft masses of lime.

Included with this soil in mapping are small areas of Nunn clay loam, 0 to 3 percent slopes; Sampson loam, 0 to 3 percent slopes; and Ustic Torrifluvents, loamy.

Permeability of this Manzanola soil is slow. Effective rooting depth is 60 inches or more. Available water capacity is high. Surface runoff is slow, and the hazard of erosion is moderate.

Most areas of this soil are used for irrigated crops. The main crops are alfalfa, corn, small grain, and pasture. Use of deep-rooted crops, timely tillage, and crop residue to keep the soil in good tilth are necessary on this soil. A small acreage of this soil is used for the production of forage sorghum or sudangrass for feed crops. The remaining acreage is used as nonirrigated cropland and rangeland.

This soil is well suited to plants for suitable grazing, and both grasses and legumes grow well if the soil is irrigated.

The native vegetation is mainly alkali sacaton, vinemesquite, western wheatgrass, blue grama, and lesser amounts of switchgrass. Big bluestem, switchgrass, and junegrass are also present where this soil occurs in the northern part of the survey area.

Stocking rates and distribution of grazing should be controlled to facilitate uniform grazing. Fencing and properly locating livestock watering facilities help to control grazing. With good range management, this soil produces good quantities of forage.

Windbreaks and environmental plantings are generally well suited to this soil. Summer fallow a year prior to planting and continued cultivation for weed control are needed to insure the establishment and survival of plantings. Trees that are best suited and have good survival are Rocky Mountain juniper, eastern redcedar, ponderosa pine, Siberian elm, Russian-olive, and hackberry. Shrubs that are best suited are skunkbush sumac, lilac, Siberian peashrub, and American plum.

This soil is suited to wildlife habitat. It is best suited to habitat for openland and rangeland wildlife. In cropland areas, habitat favorable for ring-necked pheasant, mourning dove, and many nongame species can be developed by establishing wildlife areas for nesting and escape cover. For pheasant, undisturbed nesting cover is vital and should be provided for in plans for habitat development. This is especially true in areas of intensive farming. Rangeland wildlife, such as pronghorn antelope, can be encouraged by developing livestock watering facilities, properly managing livestock grazing, and reseeding range where needed.

The main limitations for urban use of this soil are slow permeability and shrink-swell potential. Septic tank absorption fields do not function well because of the slow permeability. Special designs for buildings and roads are required to overcome the limitation of the shrink-swell potential. Capability subclasses IIs, irrigated, and IVe, nonirrigated.

52—Manzanola clay loam, 1 to 3 percent slopes. This deep, well drained soil formed in calcareous loamy alluvium on fans and terraces. Elevation ranges from about 5,200 to 6,000 feet. The average annual precipitation is about 13 inches, the average annual air temperature is about 49 degrees F, and the average frost-free period is about 145 days.

Typically, the surface layer is grayish brown clay loam about 6 inches thick. The subsoil is grayish brown heavy clay loam about 26 inches thick. The substratum is grayish brown clay loam to a depth of 60 inches or more. The lower part of the subsoil and the substratum contain visible soft masses of lime.

Included with this soil in mapping are small areas of Manzanola clay loam, 0 to 1 percent slopes; Nunn clay loam, 0 to 3 percent slopes; and Sampson loam, 0 to 3 percent slopes.

Permeability of this Manzanola soil is slow. Effective rooting depth is 60 inches or more. Available water capacity is high. Surface runoff is medium, and the hazard of erosion is moderate.

About 50 percent of the acreage of this soil is used for irrigated crops. The main crops are alfalfa, corn, small grain, and pasture. Use of deep-rooted crops, timely tillage, and crop residue to keep the soil in good tilth is necessary. A small percentage of this soil is used for the production of forage sorghum or sudangrass for feed crops. The remaining acreage is used as rangeland.

This soil is well suited to plants suitable for grazing, and grass and legumes grow well if it is irrigated.

The native vegetation is mainly alkali sacaton, vinemesquite, western wheatgrass, blue grama, and lesser amounts of switchgrass. Big bluestem, switchgrass, and junegrass are also present where this soil occurs in the northern part of the survey area.

Stocking rates and distribution of grazing should be controlled to facilitate uniform grazing. Fences and proper location of livestock watering facilities help to control grazing. With good range management, this soil produces good quantities of forage.

Windbreaks and environmental plantings generally are well suited to this soil. Summer fallow a year prior to planting and continued cultivation for weed control are needed to insure the establishment and survival of plantings. Trees that are best suited and have good survival are Rocky Mountain juniper, eastern redcedar, ponderosa pine, Siberian elm, Russian-olive, and hackberry. Shrubs that are best suited are skunkbush sumac, lilac, Siberian peashrub, and American plum.

This soil is suited to wildlife habitat. It is best suited to habitat for openland and rangeland wildlife. In cropland areas, habitat favorable for ring-necked pheasant, mourning dove, and many nongame species can be developed by establishing areas for nesting and escape cover. For pheasant, undisturbed nesting cover is vital and should be provided for in plans for habitat development. This is especially true in areas of intensive farming. Rangeland wildlife, such as pronghorn antelope, can be assisted by developing livestock watering facilities, properly managing livestock grazing, and reseeding range where needed.

The main limitations for urban use of this soil are slow permeability and high shrink-swell potential. Septic tank absorption fields do not function well as a result of the slow permeability. Special designs for buildings and roads are required to overcome the limitation of the high shrink-swell potential. Capability subclasses IVe, nonirrigated, and IIe, irrigated.

53—Manzanola clay loam, 3 to 9 percent slopes. This deep, well drained soil formed in calcareous loamy alluvium on fans, terraces, and valley side slopes. Elevation ranges from about 5,200 to 6,000 feet. The average annual precipitation is about 13 inches, the average annual air temperature is about 49 degrees F, and the average frost-free period is about 145 days.

Typically, the surface layer is grayish brown clay loam about 6 inches thick. The subsoil is grayish brown heavy clay loam about 26 inches thick. The substratum is grayish brown clay loam to a depth of 60 inches or more. The lower part of the subsoil and the substratum contain visible soft masses of lime.

Included with this soil in mapping are small areas of Manvel loam, 3 to 9 percent slopes; Neville-Rednun complex, 3 to 9 percent slopes; and Satanta-Neville complex, 3 to 8 percent slopes.

Permeability of this Manzanola soil is slow. Effective rooting depth is 60 inches or more. Available water capacity is high. Surface runoff is rapid, and the hazard of erosion is high.

Most areas of this soil are used as rangeland and for military maneuvers.

This soil is well suited to the production of native vegetation suitable for grazing. The native vegetation is mainly blue grama, western wheatgrass, side-oats grama, dropseed, and galleta. Production varies from year to year, depending on amount of precipitation.

Fencing and properly locating livestock watering facilities help to control grazing. Deferment of grazing may be necessary to maintain a needed balance between livestock use and forage production. In areas where the plant cover has been depleted, pitting can be used to help the native vegetation recover. Chemical control practices may be needed in disturbed areas where dense stands of pricklypear occur. Ample amounts of litter and forage need to be left on the soil because of the high hazard of soil blowing.

Windbreaks and environmental plantings generally are well suited to this soil. Summer fallow a year prior to planting and continued cultivation for weed control are needed to insure the establishment and survival of plantings. Trees that are best suited and have good survival are Rocky Mountain juniper, eastern redcedar, ponderosa pine, Siberian elm, Russian-olive, and hackberry. Shrubs that are best suited are skunkbush sumac, lilac, Siberian peashrub, and American plum.

This soil is suited to wildlife habitat. It is best suited to habitat for openland and rangeland wildlife. Rangeland wildlife, such as pronghorn antelope, can be encouraged by developing livestock watering facilities, properly managing livestock grazing, and reseeding range where needed.

The main limitations of this soil for urban uses are slow permeability and high shrink-swell potential. Septic tank absorption fields do not function well because of the slow permeability. Special designs for buildings and roads are required to overcome the limitation of high shrink-swell potential. Capability subclass VIe.

54—Midway clay loam, 3 to 25 percent slopes. This shallow, well drained soil formed in residuum derived from calcareous shale on uplands. Elevation ranges from 5,200 to 6,200 feet. The average annual precipitation is about 13 inches, the average annual air temperature is about 49 degrees F, and the frost-free period is about 145 days.

Typically, the surface layer is light yellowish brown clay loam about 4 inches thick. The underlying material is light yellowish brown clay about 4 inches thick and grayish brown clay that contains 50 percent soft shale fragments and is about 5 inches thick. Shale is at a depth of 13 inches.

Included with this soil in mapping are small areas of Louviers silty clay loam, 3 to 18 percent slopes; Nelson-Tassel fine sandy loams, 3 to 18 percent slopes; and Razor clay loam, 3 to 9 percent slopes.

Permeability of this Midway soil is slow. Effective rooting depth is less than 20 inches. Available water capacity is low. Surface runoff is medium to rapid, and the hazard of erosion is moderate to high.

Most areas of this soil are used as rangeland.

The native vegetation is mainly blue grama, galleta, alkali sacaton, western wheatgrass, and fourwing saltbush. Little bluestem, side-oats grama, and needleandthread are also present where this soil occurs in the northern part of the survey area. The presence of princesplume, two-groove milkvetch, and Fremont goldenweed indicates that selenium-bearing plants are in the stand.

This soil is difficult to revegetate, and it is therefore especially important that livestock grazing be carefully managed. Excessive removal of vegetation can result in severe erosion. Properly locating livestock watering facilities helps to control grazing.

Windbreak and environmental plantings generally are not suited to this soil. Onsite investigation is needed to determine if plantings are feasible.

This treeless soil produces little vegetation, especially in times of drought, when annual production may be as low as 300 pounds per acre. Rangeland wildlife, such as antelope and scaled quail, can be encouraged by properly managing livestock grazing, installing livestock watering facilities, and reseeding range where necessary.

The main limitations for the use of this soil as sites for buildings and homes are shallow depth to shale and high shrink-swell potential. Septic tank absorption fields do not function properly because of the slow permeability of this soil. Practices are needed to reduce surface runoff and thus keep erosion to a minimum. Special designs for buildings and roads are needed because of the shallow

depth to shale and high shrink-swell potential. Capability subclass VIIe.

55—Nederland cobbly sandy loam, 9 to 25 percent slopes. This deep, well drained soil formed in cobbly and gravelly alluvium or outwash on upland fans and terraces. Elevation ranges from 6,000 to 7,000 feet. The average annual precipitation is about 15 inches, the average annual air temperature is about 47 degrees F, and the average frost-free period is about 135 days.

Typically, the surface layer is brown cobbly sandy loam about 5 inches thick. The subsoil, about 23 inches thick, is brown very cobbly loam in the upper part and reddish brown very cobbly clay loam in the lower part. The substratum is reddish brown very cobbly sandy loam to a depth of 60 inches or more.

Included with this soil in mapping are small areas of Chaseville gravelly sandy loam, 8 to 40 percent slopes; Rizozo-Neville complex, 3 to 30 percent slopes; and Satanta-Neville complex, 3 to 8 percent slopes.

Permeability of this Nederland soil is moderate. Effective rooting depth is 60 inches or more. Available water capacity is moderate. Surface runoff is medium, and the hazard of erosion is slight to moderate.

This soil is used for recreation and wildlife habitat and for limited livestock grazing and wood crop production.

The native vegetation is mainly western wheatgrass, side-oats grama, needleandthread, and little bluestem. The dominant shrub on this site is true mountainmahogany. Large amounts of yucca occur in some areas.

Properly locating livestock watering facilities helps to control grazing.

This soil is suited to the production of juniper and pinyon pine. It is capable of producing 4 cords per acre in a stand of trees that average 5 inches in diameter at a height of 1 foot. The main limitation for its use for wood crop production is the presence of stones on the surface. The stones can affect felling, yarding, and other operations involving the use of equipment.

Rangeland wildlife such as antelope, cottontail, coyote, and scaled quail are best adapted for life on this droughty soil. Forage production is typically low, and proper livestock grazing management is necessary if wildlife and livestock share the range. Livestock watering developments are also important, and they are used by various wildlife species.

The main limitations of this soil for homesites and other urban uses are steepness of slope and the cobbly and stony nature of the soil. Sites and buildings need to be designed to overcome these limitations. Roads and streets must be designed to minimize frost-heave damage. Access roads must have adequate cut-slope grade and be provided with drains to control surface runoff and thus keep soil losses to a minimum. A surface dressing of topsoil is desirable where the cobbly subsoil is exposed during site preparation. Capability subclass VIIs.

56—Nelson-Tassel fine sandy loams, 3 to 18 percent slopes. These gently sloping to moderately steep soils are on hills and ridges of uplands. Coarse fragments of ironstone or fine grained sandstone gravel are commonly scattered on the surface of these soils. Elevation ranges from 5,600 to 6,400 feet. The average annual precipitation is about 13 inches, the average annual air temperature is about 49 degrees F, and the average frost-free period is about 145 days.

Included with these soils in mapping are areas of Midway clay loam, 3 to 25 percent slopes; Razor clay loam, 3 to 9 percent slopes; and Wiley silt loam, 3 to 9 percent slopes.

The Nelson soil makes up about 45 percent of the complex, the Tassel soil about 30 percent, and other soils about 25 percent. The Nelson soil is commonly in the lower positions on the landscape and has slopes of 3 to 12 percent. The Tassel soil is in the higher positions and has slopes of 3 to 18 percent.

The Nelson soil is moderately deep and well drained. It formed in moderately coarse textured, calcareous residuum derived from interbedded sedimentary rock. Typically, the surface layer is grayish brown fine sandy loam about 7 inches thick. The substratum is light brownish gray fine sandy loam about 19 inches thick. Interbedded weathered sandstone, shale, and loamstone are at a depth of about 26 inches.

Permeability of the Nelson soil is moderately rapid. The effective rooting depth is 20 to 40 inches. Available water capacity is low. Surface runoff is slow, and the hazard of erosion is moderate.

The Tassel soil is shallow and well drained. It formed in calcareous residuum derived from sandstone. Typically, the surface layer is grayish brown fine sandy loam about 4 inches thick. The substratum is brown fine sandy loam about 3 inches thick over pale brown sandy loam about 3 inches thick. Sandstone is at a depth of about 10 inches.

Permeability of the Tassel soil is moderately rapid. Effective rooting depth is less than 20 inches. Available water capacity is low. Surface runoff is medium, and the hazard of erosion is moderate to high.

Almost all areas of these soils are used as rangeland.

These soils are suited to the production of native vegetation suitable for grazing. Native vegetation is mainly blue grama, which has a typical bunchgrass growth form and makes up one-third to one-half of the cover. Other species are sand dropseed, needleandthread, side-oats grama, and buckwheat.

Seeding is advisable if the range has deteriorated, and seeding the native grasses is a good practice. If the range is severely eroded and blowouts have developed, the new seeding should be fertilized. Brush control may be needed, and grazing management may improve the depleted range. Grazing should be managed so that enough forage is left standing to protect the soil from blowing, to increase infiltration of water, and to catch and hold snow.

Windbreaks and environmental plantings generally are not suited to this soil. Onsite investigation is needed to determine if plantings are feasible.

These soils are best suited to habitat for openland and rangeland wildlife. Rangeland widlife, such as pronghorn antelope, can be encouraged by developing livestock watering facilities, properly managing livestock grazing, and reseeding range where needed.

The potential of these soils for homesites in places is limited by depth to bedrock and slope. Deep cuts, to provide essentially level building sites, can expose bedrock. Roads on the Nelson soil must be designed to minimize frost-heave damage. Because of the depth to sandstone, septic tank absorption fields do not function properly. Capability subclass VIe.

57—Neville fine sandy loam, 3 to 9 percent slopes. This deep, well drained soil formed in calcareous loamy alluvium weathered from red-bed sandstone and shale on uplands. Elevation ranges from 5,900 to 6,500 feet. The average annual precipitation is about 14 inches, the average annual temperature is about 47 degrees F, and the frost-free period is about 140 days.

Typically, the surface layer is reddish gray fine sandy loam about 4 inches thick. The substratum to a depth of 60 inches is reddish brown heavy fine sandy loam about 6 inches thick over light reddish brown loam.

Included with this soil in mapping are small areas of Rednun soils; Rizozo soils; and Satanta loam, 3 to 5 percent slopes.

Permeability of this Neville soil is moderate. Effective rooting depth is 60 inches or more. Available water capacity is high. Surface runoff is medium, and the hazards of erosion and soil blowing are moderate. Some gullies have developed along drainageways and trails.

This soil is used as rangeland, for wildlife habitat, and for military maneuvers.

The native vegetation is mainly western wheatgrass, needlegrasses, big bluestem, side-oats grama, blue grama, and native bluegrasses. If the range has deteriorated, blue grama, junegrass, and native bluegrasses increase. Sleepygrass and annuals replace these grasses if the range has seriously deteriorated.

Seeding is a good practice if the range is in poor condition. Seeding of the native vegetation is desirable, but the range can also be seeded with species of tame grasses such as Nordan crested wheatgrass, Russian wildrye, pubescent wheatgrass, or intermediate wheatgrass. Deferment of grazing and other good range management practices help to maintain vigor and growth of plants. Fencing and properly locating livestock watering facilities also help to control grazing.

This soil is best suited to habitat for openland and rangeland wildlife. In cropland areas, habitat favorable for ring-necked pheasant, mourning dove, and many nongame species can be developed by establishing areas for nesting and escape cover. For pheasant, undisturbed nesting cover is vital and should be provided for in plans for habitat development. Rangeland widlife, such as pronghorn antelope, can be encouraged by developing livestock watering facilities, properly managing livestock grazing, and reseeding range where needed.

The main limitations for construction on this soil are low bearing strength and moderate shrink-swell potential. Roads and streets require special design because the soil has limited ability to support a load and because of potential frost action. Erosion on this soil is a concern. Existing vegetation should be maintained, and disturbance of the soil should be minimized. Capability subclass IVe.

58—Neville-Rednun complex, 3 to 9 percent slopes. These gently to moderately sloping soils are on uplands. Elevation ranges from 5,900 to 6,500 feet. The average annual precipitation is about 14 inches, the average annual air temperature is about 47 degrees F, and the average frost-free period is about 140 days.

The Neville soil makes up about 60 percent of this complex, the Rednun soil about 30 percent, and included areas about 10 percent.

Included with these soils in mapping are areas of Satanta loam, 3 to 5 percent slopes, and a few outcrops of red sandstone. The Rednun soil is on the less sloping parts of the landscape.

The Neville soil is deep and well drained. It formed in calcareous loamy alluvium derived from red-bed sandstone and shale. Typically, the surface layer is reddish gray fine sandy loam about 4 inches thick. The substratum is reddish brown heavy fine sandy loam about 6 inches thick over light reddish brown loam that extends to a depth of 60 inches or more.

Permeability of the Neville soil is moderate. Effective rooting depth is 60 inches or more. Available water capacity is high. Surface runoff is medium, and the hazards of erosion and soil blowing are moderate. Some gullies have formed along drainageways and trails.

The Rednun soil is deep and well drained. It formed in calcareous alluvial fan sediment derived from red-bed sandstone and shale. Typically, the surface layer is brown loam about 6 inches thick. The subsoil, about 35 inches thick, is reddish brown heavy clay loam in the upper part and sandy clay loam in the lower part. The substratum is reddish brown sandy clay loam to a depth of 60 inches or more.

Permeability of the Rednun soil is slow. Effective rooting depth is 60 inches or more. Available water capacity is high. Surface runoff is medium, and the hazard of erosion is slight to moderate.

These soils are used as rangeland, for wildlife habitat, and for military maneuvers.

The native vegetation is mainly western wheatgrass, needlegrasses, big bluestem, side-oats grama, blue grama, and native bluegrasses. If the range has deteriorated, blue grama, junegrass, and native bluegrasses increase. Sleepygrass and annuals replace these grasses if the range has seriously deteriorated.

Seeding is a good practice if the range is in poor condition. Seeding of the native vegetation is desirable, but the range can also be seeded with species of tame grasses such as Nordan crested wheatgrass, Russian wildrye, pubescent wheatgrass, or intermediate wheatgrass. Deferment of grazing and other good range management prac-

tices help to maintain vigor and growth of plants. Fencing and properly locating livestock watering facilities also help to control grazing.

Windbreaks and environmental plantings generally are well suited to these soils. Summer fallow a year prior to planting and continued cultivation for weed control are needed to insure establishment and survival. Trees that are best suited to these soils are Rocky Mountain juniper, eastern redcedar, ponderosa pine, Siberian elm, Russian-olive, and hackberry. Shrubs that are best suited to these soils are skunkbush sumac, lilac, Siberian peashrub, and American plum.

These soils are best suited to habitat for openland and rangeland wildlife. In cropland areas, habitat favorable for ring-necked pheasant, mourning dove, and many nongame species can be developed by establishing areas for nesting and escape cover. Rangeland widlife, such as pronghorn antelope, can be encouraged by developing livestock watering facilities, properly managing livestock grazing, and reseeding range where needed.

The main limitations of the Neville soil for urban use are its limited ability to support a load, moderate shrink-swell potential, and frost action potential. The main limitations of the Rednun soil are slow permeability, shrink-swell potential, and frost action potential. Special designs for buildings and roads are needed to overcome these limitations. Community sewage systems may be required because septic tank absorption fields do not function properly where permeability is slow. Capability subclass IVe.

59—Nunn clay loam, 0 to 3 percent slopes. This deep, well drained soil is on terraces, fans, and uplands. It formed in mixed alluvium. Elevation ranges from about 5,400 to 6,500 feet. The average annual precipitation is about 14 inches, the average annual air temperature is about 47 degrees F, and the average frost-free period is about 145 days.

Typically, the surface layer is grayish brown clay loam about 12 inches thick. The subsoil is grayish brown heavy clay loam about 18 inches thick. The substratum to a depth of 72 inches is light olive brown sandy clay loam in the upper part and light brownish gray clay in the lower part. Visible lime occurs as soft masses and streaks throughout the substratum.

Included with this soil in mapping are small areas of Manzanola clay loam, 0 to 1 percent slopes; Manzanola clay loam, 1 to 3 percent slopes; Sampson loam, 0 to 3 percent slopes; and Ustic Torrifluvents, loamy.

Permeability of this Nunn soil is moderately slow. Effective rooting depth is 60 inches or more. Available water capacity is high. Surface runoff is slow to medium, and the hazard of erosion is slight.

About 70 percent of the acreage of this soil is in dryland and irrigated crops. Wheat is the main dryland crop, and corn and alfalfa are the main irrigated crops. The remaining acreage is used as rangeland.

This soil is suited to the production of native vegetation suitable for grazing. The native vegetation is mainly western wheatgrass, blue grama, alkali sacaton, needleandthread, and side-oats grama. Galleta and fourwing saltbush are also present where this soil occurs in the southern part of the survey area. The presence of princesplume, two-groove milkvetch, and Fremont goldenweed indicates that selenium-bearing plants are in the stand.

Good grazing management is essential to maintain the desirable grasses. Deferment of grazing early in spring helps to maintain the vigor of cool-season grasses. Properly locating livestock watering facilities helps to control grazing.

Windbreaks and environmental plantings generally are well suited to this soil. Summer fallow a year prior to planting and continued cultivation for weed control are needed to insure the establishment and survival of plantings. Trees that are best suited and have good survival are Rocky Mountain juniper, eastern redcedar, ponderosa pine, Siberian elm, Russian-olive, and hackberry. Shrubs that are best suited are skunkbush sumac, lilac, Siberian peashrub, and American plum.

This soil is best suited to habitat for openland and rangeland wildlife. In cropland areas, habitat favorable for ring-necked pheasant, mourning dove, and many nongame species can be developed by providing nesting areas and escape cover. For pheasant, undisturbed nesting cover is vital and should be provided for in plans for habitat development; this is especially true for intensively farmed areas. Rangeland wildlife, such as pronghorn antelope, can be encouraged by developing livestock watering facilities, properly managing livestock grazing, and reseeding range where needed.

The main limitations of this soil for urban use are slow permeability, low strength, and shrink-swell potential. Buildings and roads must be designed to overcome the limitations of low bearing strength and shrink-swell potential. Septic tank absorption fields do not function properly because of the slow permeability. Capability subclasses IIIc, nonirrigated, and IIe, irrigated.

60—Olney sandy loam, 0 to 3 percent slopes. This deep, well drained soil formed in calcareous sandy sediment on uplands. Elevation ranges from 5,200 to 6,000 feet. The average annual precipitation is about 13 inches, the average annual air temperature is about 49 degrees F, and the average frost-free period is about 145 days.

Typically, the surface layer is grayish brown sandy loam about 6 inches thick. The subsoil, about 21 inches thick, is brown sandy clay loam in the upper 7 inches and pale brown sandy clay loam grading to sandy loam in the lower 14 inches. The substratum to a depth of 60 inches is very pale brown sandy loam that grades to loamy sand. The lower part of the subsoil and the substratum have visible lime in the form of soft masses and seams.

Included with this soil in mapping are small areas of Olney and Vona soils, eroded; Vona sandy loam, 1 to 3 percent slopes; and soils that are similar to this Olney soil in the upper 40 inches but that are very dark brown and loamy below a depth of 40 inches. Also included are

several wet-weather lakes, usually less than 2 acres in size.

Permeability of this Olney soil is moderate. Effective rooting depth is 60 inches or more. Available water capacity is moderate. Surface runoff is slow. The hazard of erosion generally is moderate, but it is high where this soil is under dryland cultivation.

This soil is used for nonirrigated crops and for range.

Sorghum, sudangrass, and millet grown for forage and hay are the main crops. Pinto beans and grain sorghums are also grown. All of these crops except pinto beans respond to nitrogen fertilizer. This soil is very susceptible to soil blowing. Use of crop residue, stripcropping, and emergency tillage helps to control soil blowing.

This soil is suited to the production of native vegetation suitable for grazing. The native vegetation is mainly blue grama, which has a typical bunchgrass growth form and makes up one-third to one-half of the cover. Other species are sand dropseed, needleandthread, side-oats grama, and buckwheat.

Seeding is a suitable practice if the range has deteriorated. Seeding of native grasses is a good practice. If the range is severely eroded and blowouts have developed, fertilizing the new seeding is a good practice. Brush control may be needed, and grazing management may help to improve the depleted range. Grazing should be managed so that enough forage is left standing to protect the soil from blowing, to increase infiltration of water, and to catch and hold snow.

Windbreaks and environmental plantings generally are suited to this soil. Soil blowing is the main limitation to the establishment of trees and shrubs. This limitation can be overcome by cultivating only in the tree rows and leaving a strip of vegetation between the rows. Supplemental irrigation may be needed when planting and during dry periods. Trees that are best suited and have good survival are Rocky Mountain juniper, eastern redcedar, ponderosa pine, Siberian elm, Russian-olive, and hackberry. Shrubs that are best suited are skunkbush sumac, lilac, and Siberian peashrub.

This soil is suited to wildlife habitat. It is best suited to habitat for openland and rangeland wildlife. In cropland areas, habitat favorable for ring-necked pheasant, mourning dove, and many nongame species can be developed by providing nesting areas and escape cover. For pheasant, undisturbed nesting cover is vital and should be provided for in plans for habitat development, especially in areas of intensive farming. Rangeland wildlife, such as pronghorn antelope, can be encouraged by developing livestock watering facilities, properly managing livestock grazing, and reseeding range where needed.

The main limitations for urban development on this soil are the frost-action potential, the shrink-swell potential of the subsoil, and the hazard of soil blowing. Roads, streets, and buildings need to be designed to minimize the effects of the shrink-swell potential and frost-heave damage. Erosion control practices are needed to reduce soil blowing when the soil surface is bare during construction. Capability subclass IVe.

61—Olney sandy loam, 3 to 5 percent slopes. This deep, well drained, sandy soil formed in calcareous sandy sediment on uplands. Elevation ranges from 5,200 to 6,000 feet. The average annual precipitation is about 13 inches, the average annual air temperature is about 49 degrees F, and the average frost-free period is about 145 days.

Typically, the surface layer is grayish brown sandy loam about 6 inches thick. The subsoil, about 21 inches thick, is brown sandy clay loam in the upper 7 inches and pale brown sandy clay loam that grades to sandy loam in the lower 14 inches. The substratum to a depth of 60 inches is very pale brown sandy loam that grades to loamy sand. The lower part of the subsoil and the substratum have visible lime in the form of soft masses and seams.

Included with this soil in mapping are small areas of Olney and Vona soils, eroded; Vona sandy loam, 3 to 9 percent slopes; and soils that are similar to this Olney soil but are very dark brown loam below a depth of 40 inches. Also included are a few wet-weather lakes, usually less than 2 acres in size.

Permeability of this Olney soil is moderate. Effective rooting depth is 60 inches or more. Available water capacity is moderate. Surface runoff is medium. The hazard of erosion generally is moderate, but it is high where this soil is dryfarmed. The soil is very susceptible to soil blowing.

Most of the acreage is used as rangeland. Some of the acreage is dryfarmed, and a small acreage is farmed under sprinkler irrigation.

This soil is suited to the production of native vegetation suitable for grazing. The native vegetation is mainly blue grama, which has a typical bunchgrass growth form and makes up one-third to one-half of the cover. Other species are sand dropseed, needleandthread, side-oats grama, and buckwheat.

Seeding is advisable if the range has deteriorated. Seeding the native grasses is a good practice. If the range is severely eroded and blowouts have developed, fertilizing the new seeding is a good practice. Brush control may be needed, and grazing management may help to improve the depleted range. Grazing should be managed so that enough forage is left standing to protect the soil from blowing, to increase the infiltration of water, and to catch and hold snow.

Windbreaks and environmental plantings generally are suited to this soil. Soil blowing is the main limitation to the establishment of trees and shrubs. This limitation can be overcome by cultivating only in the tree rows and leaving a strip of vegetation between the rows. Supplemental irrigation may be needed when planting and during dry periods. Trees that are best suited and have good survival are Rocky Mountain juniper, eastern redcedar, ponderosa pine, Siberian elm, Russian-olive, and hackberry. Shrubs that are best suited are skunkbush sumac, lilac, and Siberian peashrub.

This soil is best suited to habitat for openland and rangeland wildlife. In cropland areas, habitat favorable for

ring-necked pheasant, mourning dove, and many nongame species can be developed by providing nesting areas and escape cover. For pheasant, undisturbed nesting cover is vital and should be provided for in plans for habitat development. Rangeland wildlife, such as pronghorn antelope, can be encouraged by developing livestock watering facilities, properly managing livestock grazing, and reseeding range where needed.

The main limitations for urban development are the shrink-swell potential of the subsoil, frost-action potential, and the hazard of soil blowing. Roads and streets and buildings need to be designed to minimize the effects of the shrink-swell potential and frost-heave damage. Practices that reduce the hazard of soil blowing are needed when the soil surface is bare during construction. Capability subclass IVe.

62—Olney and Vona soils, eroded. This undifferentiated group is on uplands. Slopes range from 0 to 9 percent but average about 3 percent. Elevation ranges from 5,200 to 6,000 feet. The average annual precipitation is about 13 inches, the average annual air temperature is about 49 degrees F, and the frost-free period is about 145 days.

Both the Olney soil and the Vona soil may occur in each delineated area, or each soil may occur separately.

Included with these soils in mapping are small areas of Olney sandy loam, 0 to 3 percent slopes; Olney sandy loam, 3 to 5 percent slopes; Vona sandy loam, 1 to 3 percent slopes; and Vona sandy loam, 3 to 9 percent slopes.

The Olney soil is deep and well drained. It formed in calcareous sandy sediment. The sandy loam surface layer in most areas has been lost, primarily as a result of soil blowing, exposing the subsoil and in some places the substratum. In some places the surface has a choppy, or dunelike, appearance because of the accumulation of wind-deposited soil material. The subsoil, where present, is about 21 inches thick. It is brown sandy clay loam in the upper 7 inches and pale brown sandy clay loam that grades to sandy loam in the lower 14 inches. The substratum extends to a depth of 60 inches or more. It is very pale brown sandy loam that grades to loamy sand. The lower part of the subsoil and the substratum have visible lime in the form of soft masses and seams.

Permeability of the Olney soil is moderate. Effective rooting depth is 60 inches or more. Available water capacity is moderate. Surface runoff is slow to medium, and the hazard of erosion is high. Erosion is mainly a result of soil blowing (fig. 4), but in places rills and gullies have been produced by water erosion.

The Vona soil is deep and well drained. It formed in sandy, calcareous, eolian material. The sandy loam surface layer in most areas of this soil has been lost mainly as a result of soil blowing, exposing the subsoil and in some places the substratum. In some places the surface has a choppy, or dunelike, appearance because of the accumulation of wind-deposited soil material. The subsoil is brown sandy loam about 8 inches thick where it has not been eroded. The substratum extends to a depth of 60 inches or more. It is pale brown to very pale brown sandy loam in the upper part and grades to light yellowish brown fine sandy loam in the lower part.

Permeability of the Vona soil is moderately rapid. Effective rooting depth is 60 inches or more. Available water capacity is moderate. Surface runoff is slow, and the hazard of erosion is high. Erosion is mainly a result of soil blowing, but in places some rills and gullies have been produced by water erosion.

These soils are used mostly as rangeland.

These soils are not suited to dryland farming. Most of the acreage was previously cultivated, but the major part of this has been seeded to grass or abandoned.

These soils are suited to the production of native vegetation suitable for grazing. The native vegetation is mainly blue grama, which has a typical bunchgrass growth form and makes up one-third to one-half of the cover. Other species are sand dropseed, needleandthread, side-oats grama, and buckwheat.

Seeding is advisable if the range has deteriorated. Seeding the native grasses is a good practice. If the range is severely eroded and blowouts have developed, fertilizing the new seeding is a good practice. Brush control may be needed, and grazing management may improve the depleted range. Grazing should be managed so that enough forage is left standing to protect the soil from blowing, to increase infiltration of water, and to catch and hold snow.

These soils are generally suited to windbreaks and environmental plantings. Soil blowing is the main limitation to the establishment of trees and shrubs. This limitation can be overcome by cultivating only in the tree rows and leaving a strip of vegetation between the rows. Supplemental irrigation may be needed when planting and during dry periods. Trees that are best suited and have good survival are Rocky Mountain juniper, eastern redcedar, ponderosa pine, Siberian elm, Russian-olive, and hackberry. Shrubs that are best suited are skunkbush sumac, lilac, and Siberian peashrub.

These soils are best suited to habitat for openland and rangeland wildlife. Rangeland wildlife, such as pronghorn antelope, can be encouraged by developing livestock watering facilities, properly managing livestock grazing, and reseeding range where needed.

The main limitations of these soils for urban development are frost-action potential and the hazard of soil blowing. Roads and streets need to be designed to minimize frost-heave damage. Practices are needed to reduce soil blowing when the soil surface is bare during construction. Capability subclass VIe.

63—Paunsaugunt-Rock outcrop complex, 15 to 65 percent slopes. This moderately steep to very steep complex is on mountains. Elevation ranges from 7,200 to 8,000 feet. The average annual precipitation is about 15 inches, and the average annual air temperature is about 43 degrees F.

The Paunsaugunt soil makes up about 50 percent of the complex and Rock outcrop about 40 percent. About 10

percent of the complex is soils that are similar to the Paunsaugunt soil but are moderately deep to deep.

The Paunsaugunt soil is shallow and somewhat excessively drained. It formed in residuum derived from limestone. About 40 percent of the surface is covered with gravel and flaggy material. Typically, the surface layer is very dark grayish brown gravelly loam about 6 inches thick. The substratum is grayish brown very gravelly loam about 7 inches thick over light gray very gravelly loam about 4 inches thick. Hard limestone bedrock is at a depth of about 17 inches.

Permeability of the Paunsaugunt soil is moderate. Effective rooting depth is less than 20 inches. Available water capacity is low. surface runoff is rapid, and the hazard of erosion is high.

Rock outcrop occurs throughout this complex.

This complex is used for recreation, for wildlife habitat, and is a source of crushed stone for use as concrete aggregate. It is also used for limited grazing and some harvesting of firewood.

The native vegetation is mainly mountain muhly, big bluestem, little bluestem, side-oats grama, and western wheatgrass. The common shrubs and trees are mountainmahogany, skunkbush sumac, and Rocky Mountain juniper. There are lesser amounts of ponderosa pine.

Proper range management is necessary on this soil. Proper location of livestock watering facilities helps to control grazing. Deferment of grazing helps to maintain vigor and production of plants.

This complex is suited to the production of juniper and pinon pine. It is capable of producing 4 cords per acre in a stand of trees that average 5 inches in diameter at a height of 1 foot. The main limitations for its use for wood crop production are the presence of stones on the surface and the high hazard of erosion. Stones on the surface can influence felling, yarding, and other operations involving the use of equipment. Measures must be taken to minimize erosion as a result of harvesting operations. The low available water capacity of the Paunsaugunt soil may influence seedling survival.

This complex is best suited to habitat for woodland wildlife, such as mule deer and wild turkey. The combination of juniper, pinon pine, and scattered ponderosa pine, together with Gambel oak and its mast production, makes this complex especially attractive for wild turkey. Scarcity of surface water may limit management for turkey, but this limitation can be overcome by construction of wildlife watering facilities such as guzzlers. Proper management of domestic livestock grazing and the preservation of the scattered ponderosa pine are vital to the welfare of deer and wild turkey.

The main limitations of this complex for homesites are the shallow depth to bedrock, the stony surface, and the steep slopes. Sites or buildings must be designed to overcome these limitations. Cuts, to provide essentially level sites for buildings and roads, expose the hard bedrock. Removing existing plant cover and making unnecessary excavations should be minimized. Capability subclass VIIs.

64—Penrose-Manvel complex, 3 to 45 percent slopes. These gently sloping to steep soils are on hills, ridges, and valley side slopes. Elevation ranges from 5,800 to 6,600 feet. The average annual precipitation is about 13 inches, and the average annual air temperature is about 49 degrees F.

The Penrose soil makes up about 50 percent of the complex, the Manvel soil makes up about 30 percent, and other soils about 20 percent.

Included with these soils in mapping are areas of Nederland cobbly sandy loam, 9 to 25 percent slopes, and Fortwingate-Rock outcrop complex, 15 to 60 percent slopes.

The Penrose soil is shallow and well drained. It formed in calcareous residuum derived from limestone. Slope is 3 to 45 percent. Typically, the surface layer is grayish brown channery loam about 4 inches thick. The substratum is light brownish gray channery loam about 7 inches thick. Hard limestone bedrock is at a depth of about 11 inches.

Permeability of the Penrose soil is moderate. Effective rooting depth is 10 to 20 inches. Available water capacity is low. Surface runoff is rapid, and the hazard of erosion is high.

The Manvel soil is deep and well drained. It formed in calcareous loamy alluvium derived from limestone. Slope is 3 to 15 percent. Typically, the surface layer is grayish brown loam about 3 inches thick. The substratum is light brownish gray and pale brown loam that extends to a depth of 60 inches or more.

Permeability of the Manvel soil is moderate. Effective rooting depth is 60 inches or more. Available water capacity is high. Surface runoff is medium, and the hazard of erosion is moderate.

The soils in this complex are used mainly for woodland and for limited livestock grazing. They are also used for wildlife habitat and military maneuvers.

The native vegetation consists of an overstory of pinyon and juniper and an understory of blue grama, side-oats grama, needlegrasses, and western wheatgrass. Shrubs such as mountainmahogany and skunkbush sumac also occur.

These soils are suited to the production of firewood. They are capable of producing 3 cords per acre in a stand of trees that average 5 inches in diameter at a height of 1 foot. The main limitation for the production of wood crops is the moderate hazard of erosion. Special practices that minimize erosion during harvesting should be used. Seedling mortality is severe on the Penrose soil because of low available water capacity.

These soils produce native plants that provide food and cover for mule deer, cottontail, quail, and wild turkey.

The main limitations of the Penrose soil for homesites are shallow depth to bedrock and slope. The main limitations of the Manvel soil are a limited ability to support a load and shrink-swell potential. Special designs for buildings and roads are needed to overcome these limitations. Capability subclass VIIs.

65—Perrypark gravelly sandy loam, 3 to 9 percent slopes. This deep, well drained soil is in the northwestern part of the survey area, west of Monument Creek. It formed in arkosic alluvium derived from sedimentary and granite bedrock on alluvial fans and valley side slopes. Elevation ranges from about 7,000 to 7,500 feet. The average annual precipitation is about 17 inches, the average annual air temperature is about 43 degrees F, and the average frost-free period is about 120 days.

Typically, the surface layer is very dark grayish brown gravelly sandy loam about 4 inches thick. The subsoil is reddish gray sandy clay loam about 44 inches thick. The substratum is light reddish brown gravelly sandy loam to a depth of 60 inches.

Included with this soil in mapping are small areas of Tomah-Crowfoot loamy sands, 3 to 8 percent slopes, and Jarre gravelly sandy loam, 1 to 8 percent slopes.

Permeability of this Perrypark soil is moderate. Effective rooting depth is 60 inches or more. Available water capacity is high. Runoff is medium, and the hazard of erosion is slight to moderate.

This soil is used as rangeland, for wildlife habitat, and for homesites.

This soil is well suited to the production of native vegetation suitable for grazing by cattle and sheep. The native vegetation is mainly mountain muhly, little bluestem, needleandthread, Parry oatgrass, and junegrass.

Deferment of grazing in spring helps to maintain the vigor and production of the cool-season bunchgrasses. Fences and proper location of livestock watering facilities help to control grazing.

Windbreaks and environmental plantings generally are suited to this soil. Soil blowing is the main limitation to the establishment of trees and shrubs. This limitation can be overcome by cultivating only in the tree rows and leaving a strip of vegetation between the rows. Supplemental irrigation may be needed when planting and during dry periods. Trees that are best suited and have good survival are Rocky Mountain juniper, eastern redcedar, ponderosa pine, Siberian elm, Russian-olive, and hackberry. Shrubs that are best suited are skunkbush sumac, lilac, and Siberian peashrub.

This soil is best suited to habitat for openland and rangeland wildlife. In cropland areas, habitat favorable for ring-necked pheasant, mourning dove, and many nongame species can be developed by establishing areas for nesting and escape cover. Rangeland wildlife, such as pronghorn antelope, can be encouraged by developing livestock watering facilities, properly managing livestock grazing, and reseeding range where needed.

This soil has fair potential for use as homesites. The main limitations are its limited ability to support a load, shrink-swell potential, and the potential for frost action. Buildings and roads must be designed to overcome these limitations. Capability subclass IVe.

66—Peyton sandy loam, 1 to 5 percent slopes. This deep, noncalcareous, well drained soil formed in alluvium and residuum derived from weathered arkosic sedimentary rock on uplands. Elevation ranges from 6,800 to 7,600 feet. The average annual precipitation is about 17 inches, the average annual air temperature is about 43 degrees F, and the average frost-free period is about 120 days.

Typically, the surface layer is grayish brown sandy loam about 12 inches thick. The subsoil, about 23 inches thick, is pale brown sandy clay loam in the upper 13 inches and pale brown sandy loam in the lower 10 inches. The substratum is pale brown sandy loam to a depth of 60 inches.

Included with this soil in mapping are small areas of Brussett loam, 1 to 3 percent slopes; Brussett loam, 3 to 5 percent slopes; Holderness loam, 1 to 5 percent slopes; and Pring coarse sandy loam, 3 to 8 percent slopes.

Permeability of this Peyton soil is moderate. Effective rooting depth is 60 inches or more. Available water capacity is high. Surface runoff is slow, and the hazard of erosion is slight.

About half of the acreage of this soil is used for winter wheat grown in a wheat-fallow cropping system. The other half is used for range or pasture. This soil is also suited to oats. Choice of crops is limited by the short growing season. Crop residue management, such as stubble mulching, is needed to control water erosion.

This soil is well suited to the production of native vegetation suitable for grazing. The native vegetation is mainly mountain muhly, bluestem grasses, mountain brome, needleandthread, and blue grama. This soil is subject to invasion by Kentucky bluegrass and Gambel oak. Minor amounts of forbs such as hairy goldenrod, geranium, milkvetch, low larkspur, fringed sage, and buckwheat are in the stand.

Proper location of livestock watering facilities helps to control grazing. Timely deferment of grazing is needed to protect the plant cover.

Windbreaks and environmental plantings generally are suited to this soil. Soil blowing is the main limitation to the establishment of trees and shrubs. This limitation can be overcome by cultivating only in the tree rows and leaving a strip of vegetation between the rows. Supplemental irrigation may be needed when planting and during dry periods. Trees that are best suited and have good survival are Rocky Mountain juniper, eastern redcedar, ponderosa pine, Siberian elm, Russian-olive, and hackberry. Shrubs that are best suited are skunkbush sumac, lilac, and Siberian peashrub.

This soil is suited to habitat for openland and rangeland wildlife. In cropland areas, habitat favorable for ring-necked pheasant, mourning dove, and many nongame species can be developed by establishing areas for nesting and escape cover. For pheasant, undisturbed nesting cover is vital and should be provided for in plans for habitat development. Rangeland wildlife, such as pronghorn antelope, can be encouraged by developing livestock watering facilities, properly managing livestock grazing, and reseeding range where needed.

This soil has a good potential for homesites and dwellings. The main limitations are its limited ability to

support a load and potential frost action on roads and streets. Roads and buildings can be designed to overcome these limitations. Capability subclass IVe.

67—Peyton sandy loam, 5 to 9 percent slopes. This deep, noncalcareous, well drained soil formed in alluvium and residuum derived from weathered arkosic sedimentary rock on uplands. Elevation ranges from 6,800 to 7,600 feet.

Typically, the surface layer is grayish brown sandy loam about 12 inches thick. The subsoil, about 23 inches thick, is pale brown sandy clay loam in the upper 13 inches and pale brown sandy loam in the lower 10 inches. The substratum is pale brown sandy loam to a depth of 60 inches.

Included with this soil in mapping are small areas of Holderness loam, 5 to 8 percent slopes; Pring coarse sandy loam, 3 to 8 percent slopes; and Tomah-Crowfoot loamy sands, 3 to 8 percent slopes.

Permeability of this soil is moderate. Effective rooting depth is 60 inches or more. Available water capacity is high. Surface runoff is medium, and the hazard of erosion is moderate. Gullies and rills are common.

Most of the acreage of this Peyton soil is used as rangeland. Some areas are used for wheat and oats. Stubble mulching or other crop residue management practices are needed to control water erosion. Wildlife habitat is also an important use.

This soil is well suited to the production of native vegetation suitable for grazing. The native vegetation is mainly mountain muhly, bluestem, mountain brome, needleandthread, and blue grama. This soil is subject to invasion by Kentucky bluegrass and Gambel oak. Minor amounts of forbs such as hairy goldenrod, geranium, milkvetch, low larkspur, fringed sage, and buckwheat are in the stand.

Proper location of livestock watering facilities helps to control grazing. Timely deferment of grazing is needed to protect the plant cover.

Windbreaks and environmental plantings generally are suited to this soil. Soil blowing is the main limitation to the establishment of trees and shrubs. This limitation can be overcome by cultivating only in the tree rows and leaving a strip of vegetation between the rows. Supplemental irrigation may be necessary when planting and during dry periods. Trees that are best suited and have good survival are Rocky Mountain juniper, eastern redcedar, ponderosa pine, Siberian elm, Russian-olive, and hackberry. Shrubs that are best suited are skunkbush sumac, lilac, and Siberian peashrub.

This soil is suited to habitat for openland and rangeland wildlife. Rangeland wildife, such as pronghorn antelope, can be encouraged by developing livestock watering facilities, properly managing livestock grazing, and reseeding range where needed.

This soil has good potential for homesites. The main limitation is the limited ability to support a load and potential frost action. Buildings and roads can be designed to overcome these limitations. Capability subclass IVe.

68—Peyton-Pring complex, 3 to 8 percent slopes. These gently sloping to moderately sloping soils are on valley side slopes and on uplands. Elevation ranges from 6,800 to 7,600 feet. The average annual precipitation is about 17 inches, the average annual air temperature is about 43 degrees F, and the average frost-free period is about 120 days.

The Peyton soil makes up about 40 percent of the complex, the Pring soil about 30 percent, and other soils about 30 percent.

Included with these soils in mapping are areas of Holderness loam, 1 to 5 percent slopes; Holderness loam, 5 to 8 percent slopes; and Tomah-Crowfoot loamy sands, 3 to 8 percent slopes. In some places arkosic beds of sandstone and shale are at a depth of 0 to 40 inches.

The Peyton soil is commonly on the less sloping part of the landscape. It is deep, noncalcareous, and well drained. It formed in alluvium and residuum derived from weathered arkosic sedimentary rock. Typically, the surface layer is grayish brown sandy loam about 12 inches thick. The subsoil, about 23 inches thick, is pale brown sandy clay loam in the upper 13 inches and pale brown sandy loam in the lower 10 inches. The substratum is pale brown sandy loam to a depth of 60 inches or more.

Permeability of the Peyton soil is moderate. Effective rooting depth is 60 inches or more. Available water capacity is high. Surface runoff is medium, and the hazard of erosion is moderate.

The Pring soil is deep, noncalcareous, and well drained. It formed in sandy sediment derived from weathered arkosic sedimentary rock. Typically, the surface layer is dark grayish brown coarse sandy loam about 4 inches thick. The substratum is dark grayish brown coarse sandy loam about 10 inches thick over pale brown gravelly sandy loam that extends to a depth of 60 inches or more.

Permeability of the Pring soil is rapid. Effective rooting depth is 60 inches or more. Available water capacity is moderate. Surface runoff is medium, and the hazard of erosion is moderate.

These soils are used as rangeland, for wildlife habitat, and for homesites.

These soils are well suited to the production of native vegetation suitable for grazing. The dominant native species are mountain muhly, bluestem, needleandthread, and blue grama. These soils are subject to invasion of Kentucky bluegrass and Gambel oak. Common forbs are hairy goldenrod, geranium, milkvetch, low larkspur, fringed sage, and buckwheat.

Properly locating livestock watering facilities helps to control grazing. Timely deferment of grazing is needed to protect the plant cover.

Windbreaks and environmental plantings generally are suited to these soils. Soil blowing is the main limitation to the establishment of trees and shrubs. This limitation can be overcome by cultivating only in the tree rows and leaving a strip of vegetation between the rows. Supplemental irrigation may be needed when planting and during dry periods. Trees that are best suited and have good

survival are Rocky Mountain juniper, eastern redcedar, ponderosa pine, Siberian elm, Russian-olive, and hackberry. Shrubs that are best suited are skunkbush sumac, lilac, and Siberian peashrub.

These soils are suited to habitat for openland and rangeland wildlife. Rangeland wildlife, such as pronghorn antelope, can be encouraged by developing livestock watering facilities, properly managing livestock grazing, and reseeding range where needed.

These soils have a good potential for homesites. The main limitations, especially on the Peyton soil, are low bearing strength and frost-action potential. Buildings and roads can be designed to overcome these limitations. Access roads should have adequate cut-slope grade and be provided with drains to control surface runoff and keep soil losses to a minimum. Capability subclass VIe.

69—Peyton-Pring complex, 8 to 15 percent slopes. These gently to moderately sloping soils are on valley side slopes and on uplands. Elevation ranges from 6,800 to 7,600 feet. The average annual precipitation is about 17 inches, the average annual air temperature is about 43 degrees F, and the average frost-free period is about 120 days.

The Peyton soil makes up about 40 percent of the complex, the Pring soil about 30 percent, and other soils about 30 percent.

Included with these soils in mapping are areas of Holderness loam, 8 to 15 percent slopes; Tomah-Crowfoot loamy sands, 8 to 15 percent slopes; Kettle gravelly loamy sand, 8 to 40 percent slopes; and a few areas of Rock outcrop.

The Peyton soil is commonly on the less sloping part of the landscape. It is deep, noncalcareous, and well drained. It formed in alluvium and residuum derived from weathered, arkosic, sedimentary rock. Typically, the surface layer is grayish brown sandy loam about 12 inches thick. The subsoil, about 23 inches thick, is pale brown sandy clay loam in the upper 13 inches and pale brown sandy loam in the lower 10 inches. The substratum is pale brown sandy loam to a depth of 60 inches or more.

Permeability of the Peyton soil is moderate. Effective rooting depth is 60 inches or more. Available water capacity is high. Surface runoff is medium to rapid, and the hazard of erosion is moderate to high. Some gullies have developed along drainageways and livestock trails.

The Pring soil is deep, noncalcareous, and well drained. It formed in sandy sediment derived from weathered, arkosic, sedimentary rock. Typically, the surface layer is dark grayish brown coarse sandy loam about 4 inches thick. The substratum is dark grayish brown coarse sandy loam about 10 inches thick over pale brown gravelly sandy loam that extends to a depth of 60 inches or more.

Permeability of the Pring soil is rapid. Effective rooting depth is 60 inches or more. Available water capacity is moderate. Surface runoff is medium to rapid, and the hazard of erosion is moderate to high. Some gullies have developed along drainageways and livestock trails.

The soils in this complex are used as rangeland, for wildlife habitat, and for homesites.

These soils are well suited to the production of native vegetation suitable for grazing. The dominant native species are mountain muhly, bluestem grasses, needleandthread, and blue grama. These soils are subject to invasion of Kentucky bluegrass and Gambel oak. Common forbs are hairy goldenrod, geranium, milkvetch, low larkspur, fringed sage, and buckwheat.

Properly locating livestock watering facilities helps to control grazing. Timely deferment of grazing is needed to protect the plant cover.

Windbreaks and environmental plantings generally are suited to these soils. Soil blowing is the main limitation to the establishment of trees and shrubs. This limitation can be overcome by cultivating only in the tree rows and leaving a strip of vegetation between the rows. Supplemental irrigation may be needed when planting and during dry periods. Trees that are best suited and have good survival are Rocky Mountain juniper, eastern redcedar, ponderosa pine, Siberian elm, Russian-olive, and hackberry. Shrubs that are best suited are skunkbush sumac, lilac, and Siberian peashrub.

These soils are well suited to wildlife habitat. They are best suited to habitat for openland and rangeland wildlife. Rangeland wildlife, such as pronghorn antelope, can be encouraged by developing livestock watering facilities, properly managing livestock grazing, and reseeding range where needed.

These soils have good potential for use as homesites. The main limitations are steepness of slope, limited ability to support a load, and frost-action potential. Buildings and roads can be designed to overcome these limitations. These soils also require special site or building designs because of the slope. Access roads should have adequate cut-slope grade, and drains should be provided to control surface runoff and keep soil losses to a minimum. Capability subclass VIe.

70—Pits, gravel. Gravel pits are in nearly level to rolling areas. They are open excavations several feet deep and commonly 5 acres or less in size.

Gravel pits are very low in natural fertility and are highly susceptible to soil blowing. A cover of weeds or straw helps to control erosion.

Windbreaks and environmental plantings generally are not suited to these areas. Onsite investigation is needed to determine if plantings are feasible. Capability subclass VIIIs.

71—Pring coarse sandy loam, 3 to 8 percent slopes. This deep, noncalcareous, well drained soil formed in sandy sediment derived from arkosic sedimentary rock on valley side slopes and on uplands. Elevation ranges from 6,800 to 7,600 feet. The average annual precipitation is about 17 inches, the average annual air temperature is about 43 degrees F, and the average frost-free period is about 120 days.

Typically, the surface layer is dark grayish brown coarse sandy loam about 4 inches thick. The substratum is dark grayish brown coarse sandy loam about 10 inches thick over pale brown gravelly sandy loam that extends to a depth of 60 inches or more.

Included with this soil in mapping are small areas of Alamosa loam, 1 to 3 percent slopes, along drainageways; Cruckton sandy loam, 1 to 9 percent slopes; Peyton sandy loam, 1 to 5 percent slopes; Peyton sandy loam, 5 to 9 percent slopes; and Tomah-Crowfoot loamy sands, 3 to 8 percent slopes. In some places arkose beds of sandstone and shale are at a depth of 0 to 40 inches.

Permeability of this Pring soil is rapid. Effective rooting depth is 60 inches or more. Available water capacity is moderate. Surface runoff is medium, and the hazard of erosion is moderate.

Almost all areas of this soil are used as rangeland. Some areas previously cultivated have been reseeded to grass. This soil is also used for wildlife habitat and homesites.

This soil is well suited to the production of native vegetation suitable for grazing by cattle and sheep. Rangeland vegetation is mainly mountain muhly, little bluestem, needleandthread, Parry oatgrass, and junegrass.

Deferment of grazing in spring helps to maintain vigor and production of the cool-season bunchgrasses. Fencing and properly locating livestock watering facilities help to control grazing.

Windbreaks and environmental plantings generally are suited to this soil. The hazard of soil blowing is the main limitation to the establishment of trees and shrubs. This limitation can be overcome by cultivating only in the tree rows and leaving a strip of vegetation between the rows. Supplemental irrigation may be needed when planting and during dry periods. Trees that are best suited and have good survival are Rocky Mountain juniper, eastern redcedar, ponderosa pine, Siberian elm, Russian-olive, and hackberry. Shrubs that are best suited are skunkbush sumac, lilac, and Siberian peashrub.

This soil is suited to habitat for openland and rangeland wildlife. Rangeland wildlife, such as pronghorn antelope, can be encouraged by developing livestock watering facilities, properly managing livestock grazing, and reseeding range where needed.

This soil is well suited for use as homesites. Erosion control practices are needed to control soil blowing and water erosion on construction sites where the ground cover has been removed. Capability subclass IVe.

72—Pring coarse sandy loam, 8 to 15 percent slopes. This deep, noncalcareous, well drained soil formed in sandy sediment derived from arkosic sedimentary rock on valley side slopes and on uplands. Elevation ranges from 6,800 to 7,600 feet. The average annual precipitation is about 17 inches, the average annual air temperature is about 43 degrees F, and the average frost-free period is about 120 days.

Typically, the surface layer is dark grayish brown coarse sandy loam about 4 inches thick. The substratum is dark grayish brown coarse sandy loam about 10 inches thick over pale brown gravelly sandy loam that extends to a depth of 60 inches or more.

Included with this soil in mapping are small areas of Cruckton sandy loam, 1 to 9 percent slopes; Peyton sandy loam, 5 to 9 percent slopes; and Tomah-Crowfoot loamy sands, 8 to 15 percent slopes. Arkose beds of sandstone and shale are at a depth of 0 to 40 inches in some places.

Permeability of this Pring soil is rapid. Effective rooting depth is 60 inches or more. Available water capacity is moderate. Surface runoff is medium, and the hazard of erosion is moderate. Some gullies have developed along drainageways.

Almost all areas of this soil are used as rangeland. Some areas previously cultivated have been reseeded to grass. This soil is also used for wildlife habitat and as homesites.

This soil is well suited to the production of native vegetation suitable for grazing by cattle and sheep. The native vegetation is mainly mountain muhly, little bluestem, needleandthread, Parry oatgrass, and junegrass.

Deferment of grazing in spring helps to maintain the vigor and production of the cool-season bunchgrasses. Fencing and properly locating livestock watering facilities help to control grazing.

Windbreaks and environmental plantings generally are suited to this soil. The hazard of soil blowing is the main limitation to the establishment of trees and shrubs. This limitation can be overcome by cultivating only in the tree rows and leaving a strip of vegetation between the rows. Supplemental irrigation may be needed when planting and during dry periods. Trees that are best suited and have good survival are Rocky Mountain juniper, eastern redcedar, ponderosa pine, Siberian elm, Russian-olive, and hackberry. Shrubs that are best suited are skunkbush sumac, lilac, and Siberian peashrub.

This soil is suited to habitat for openland and rangeland wildlife habitat. Rangeland wildlife, such as pronghorn antelope, can be encouraged by developing livestock watering facilities, properly managing livestock grazing, and reseeding range where needed.

This soil has good potential for urban uses. The main limitation is slope. Special site or building designs are needed because of the slope. Access roads must have adequate cut-slope grade and be provided with drains to control surface runoff. Capability subclass VIe.

73—Razor clay loam, 3 to 9 percent slopes. This moderately deep, well drained, clayey soil formed in residuum derived from calcareous shale on uplands. Elevation ranges from 5,300 to 6,100 feet. The average annual precipitation is about 13 inches, the average annual air temperature is about 49 degrees F, and the average frost-free period is about 145 days.

Typically, the surface layer is light brownish gray clay loam about 3 inches thick. The subsoil is grayish brown heavy clay loam or clay about 15 inches thick. The substratum is grayish brown clay that grades to calcareous shale at a depth of about 31 inches. Visible lime is in the lower part of the subsoil and in the substratum.

Included with this soil in mapping are small areas of Midway clay loam, 3 to 25 percent slopes; Heldt clay loam, 0 to 3 percent slopes; and Stoneham sandy loam, 3 to 8 percent slopes.

Permeability of this Razor soil is slow. Effective rooting depth is 20 to 40 inches. Available water capacity is moderate. Surface runoff is medium, and the hazard of erosion is moderate.

This soil is used mainly as rangeland.

The native vegetation is mainly alkali sacaton, western wheatgrass, and galleta. There are lesser amounts of blue grama. Fourwing saltbush is a common shrub. Needleandthread, junegrass, and side-oats grama are also present where this soil occurs in the northern part of the survey area. The presence of princesplume, two-groove milkvetch, and Fremont goldenweed indicates that selenium-bearing plants are in the stand.

This soil is very difficult to revegetate, and it is especially important that livestock grazing be carefully managed. Fencing helps to control grazing. Where the plant cover has been depleted, pitting aids the recovery of the natural vegetation.

Windbreaks and environmental plantings generally are not suited to this soil. Onsite investigation is needed to determine if plantings are feasible.

This soil is best suited to habitat for openland and rangeland wildlife. Rangeland wildlife, such as pronghorn antelope, can be encouraged by developing livestock watering facilities, properly managing livestock grazing, and reseeding range where needed.

The main limitations for homesites and urban development are slow permeability, moderate depth to shale, and shrink-swell potential. Septic tank absorption fields do not function properly because of the depth to shale and the slow permeability. Special designs for buildings and roads are required to overcome the limitations of limited depth to shale and the shrink-swell potential. Capability subclass VIe.

74—Razor stony clay loam, 5 to 15 percent slopes. This moderately deep, well drained soil formed in residuum derived from calcareous shale on uplands. Elevation ranges from 6,000 to 7,200 feet. The average annual precipitation is about 15 inches, the average annual air temperature is about 49 degrees F, and the average frost-free period is about 145 days.

Typically, the surface layer is light brownish gray stony clay loam about 4 inches thick. The subsoil is grayish brown cobbly heavy clay loam about 18 inches thick. The substratum is light brownish gray cobbly clay about 7 inches thick. Gray shale is at a depth of about 29 inches.

Included with this soil in mapping are areas of moderately steep to very steep soils on foothills; hogbacks of limestone and sandstone; Penrose-Manvel complex, 3 to 45 percent slopes; Razor clay loam, 3 to 9 percent slopes; and Jarre-Tecolote complex, 8 to 65 percent slopes.

Permeability of this Razor soil is slow. Effective rooting depth is 20 to 40 inches. Available water capacity is moderate. Surface runoff is medium to rapid, and the hazard of erosion is moderate. Some gullies have developed along drainageways and trails.

This soil is used as rangeland, for wildlife habitat, and for military maneuvers.

This soil is suited to the production of native vegetation suitable for grazing. The native vegetation is western wheatgrass, blue grama, alkali sacaton, needleandthread, and side-oats grama. The presence of princesplume, two-groove milkvetch, and Fremont goldenweed indicates that selenium-bearing plants are in the stand.

Good grazing management is essential to maintain the desirable grasses. Deferment of grazing early in spring helps to maintain the health and vigor of the cool-season grasses. Properly locating livestock watering facilities helps to control grazing.

Windbreaks and environmental plantings generally are not suited to this soil. Onsite investigation is needed to determine if plantings are feasible.

This soil is suited to wildlife habitat. It is best suited to habitat for openland and rangeland wildlife. Rangeland wildlife, such as pronghorn antelope, can be encouraged by developing livestock watering facilities, properly managing livestock grazing, and reseeding range where needed.

The main limitations for homesite development or urban use are the depth to shale, stoniness, shrink-swell potential, and slope. The limitations of soil depth and stoniness can be overcome through the use of heavy equipment when preparing building sites. Special designs for buildings and roads are needed to overcome the limitations of depth to shale, shrink-swell potential, and slope. Septic tank absorption fields do not function properly because of slow permeability and moderate depth to shale. Capability subclass VIIe.

75—Razor-Midway complex. These gently sloping to moderately steep, clayey soils formed in residuum derived from calcareous shale on uplands. Slope ranges from 3 to 25 percent. Elevation ranges from 5,300 to 6,100 feet. The average annual precipitaton is about 13 inches, the average annual air temperature is about 49 degrees F, and the average frost-free period is about 145 days.

The Razor soil makes up about 50 percent of the complex, the Midway soil about 30 percent, and other soils about 20 percent.

Included with these soils in mapping are areas of Limon clay, 0 to 3 percent slopes; Stoneham sandy loam, 3 to 8 percent slopes; and geological formations called teepee buttes. The teepee buttes are conspicuous cone-shaped piles of marine rubble that rise above the more nearly level plains and occur at random on the landscape. The material of these formations is hard sedimentary rock and some petrified marine life.

The Razor soil is moderately deep and well drained. Typically, the surface layer is light brownish gray clay loam about 3 inches thick. The subsoil is grayish brown heavy clay loam or clay about 15 inches thick. The substratum is grayish brown clay that grades to calcareous shale at a depth of about 31 inches. Visible lime is in the lower part of the subsoil and in the substratum.

Permeability of the Razor soil is slow. Effective rooting depth is 20 to 40 inches. Available water capacity is moderate. Surface runoff is medium, and the hazard of erosion is moderate.

The Midway soil is shallow and well drained. Typically, the surface layer is light yellowish brown clay loam about 4 inches thick. The substratum is light yellowish brown clay about 4 inches thick over grayish brown clay about 5 inches thick. It grades to calcareous shale at a depth of about 13 inches.

Permeability of the Midway soil is slow. Effective rooting depth is less than 20 inches. Available water capacity is low. Surface runoff is medium to rapid, and the hazard of erosion is moderate to high.

The soils in this complex are used primarily as rangeland and for wildlife habitat.

The native vegetation on these soils is mainly alkali sacaton, western wheatgrass, galleta, and blue grama; there are lesser amounts of blue grama on the Razor soil. Fourwing saltbush is a common shrub. Needleandthread, junegrass, and side-oats grama are also present where these soils occur in the northern part of the survey area. The presence of princesplume, two-groove milkvetch, and Fremont goldenweed indicates that selenium-bearing plants are in the stand.

The Razor soil is very difficult to revegetate, and it is especially important that livestock grazing be carefully managed. Fencing helps to control the distribution of grazing. Where the plant cover has been depleted, pitting aids in the recovery of the native vegetation.

The Midway soil generally is difficult to revegetate, and it is therefore important that livestock grazing be carefully managed. Excessive removal of vegetation can result in severe erosion. Properly locating livestock watering facilities helps to control grazing.

Windbreaks and environmental plantings generally are not suited to the soils in this complex. Onsite investigation is needed to determine if plantings are feasible.

These soils are suited to wildlife habitat. They are best suited to habitat for openland and rangeland wildlife. Rangeland wildlife, such as pronghorn antelope and scaled quail, can be encouraged by developing livestock watering facilities, properly managing livestock grazing, and reseeding range where needed.

The main limitations for urban use or homesite development are depth to shale, slow permeability, shrink-swell potential, and slope. Special designs for buildings and roads are needed to overcome these limitations. Because of the depth to shale and slow permeability, septic tank absorption fields do not function properly. Community sewerage systems are required in areas of moderate to high population density. Capability subclass VIe.

76—Rizozo-Neville complex, 3 to 30 percent slopes. These gently sloping to moderately steep soils are on uplands, terraces, and fans. Elevation ranges from 6,000 to 6,500 feet. The average annual precipitation is about 14 inches, the average annual air temperature is about 47 degrees F, and the average frost-free period is about 140 days.

The Rizozo soil makes up about 35 percent of the complex, the Neville soil about 25 percent, and other soils about 40 percent.

Included with these soils in mapping are areas of Fortwingate-Rock outcrop complex, 15 to 60 percent slopes; Nederland cobbly sandy loam, 9 to 25 percent slopes; Neville-Rednun complex, 3 to 9 percent slopes; and Rock outcrop.

The Rizozo soil is shallow and well drained. It formed in medium textured residuum weathered from red sandstone. Typically, the surface layer is reddish brown loam about 3 inches thick. The underlying material is reddish brown loam about 7 inches thick. Hard, red, fractured sandstone is at a depth of about 10 inches.

Permeability of the Rizozo soil is moderately rapid. Effective rooting depth is 4 to 20 inches. Available water capacity is low. Surface runoff is medium to rapid, and the hazard of erosion is moderate to high. Soil slippage is common on the steeper slopes.

The Neville soil is deep and well drained. It formed in calcareous loamy alluvium weathered from red-bed sandstone and shale. Typically, the surface layer is reddish gray fine sandy loam about 4 inches thick. The substratum is reddish brown, heavy fine sandy loam about 6 inches thick over light reddish brown loam that extends to a depth of 60 inches or more.

Permeability of the Neville soil is moderate. Effective rooting depth is 60 inches or more. Available water capacity is high. Surface runoff is medium, and the hazard of erosion is moderate. Some gullies have developed along drainageways.

The soils in this complex are used as rangeland and for wildlife habitat, recreation, and military maneuvers.

Native vegetation on the Rizozo soil consists of an overstory of pinyon and juniper and an understory of blue grama, side-oats grama, western wheatgrass, Scribner needlegrass, and needleandthread. The dominant shrubs are mountainmahogany and skunkbush sumac.

The native vegetation on the Neville soil is mainly cool- and warm-season grasses such as western wheatgrass, side-oats grama, and needleandthread. Smaller amounts of other grasses, such as little bluestem, junegrass, mountain muhly, and blue grama, are scattered throughout the stand.

Careful management of plant cover is essential on these soils, because the reestablishment of vegetation is difficult. Properly locating livestock watering facilities helps to control grazing. Proper range management is needed to prevent excessive removal of the plant cover. Interseeding is used to improve the existing vegetation. Deferment of grazing in spring increases plant vigor and soil stability.

The soils in this complex are suited to the production of firewood. They are capable of producing 7 cords per acre in a stand of trees that average 5 inches in diameter at a height of 1 foot. The main limitations for the production of wood crops are the presence of stones on the surface and a high hazard of erosion. Stones on the surface interfere with felling, yarding, and other operations involving the use of equipment. Measures must be taken to minimize erosion when harvesting timber. The low availa-

ble water capacity can influence seedling survival. Seedling mortality is severe on the Rizozo soil because of low available water capacity.

These soils are suited to habitat for wildlife such as antelope, mule deer, and wild turkey. The combination of juniper and pinyon on these soils makes them attractive to wild turkey, but a shortage of surface water may limit turkey populations. This limitation can be overcome by constructing watering facilities, such as guzzlers.

The main limitations of the Rizozo soil for construction are shallow depth to bedrock, a stony surface, and steep slopes. The main limitation of the Neville soil is its limited ability to support a load and shrink-swell potential. Buildings and roads must be designed to overcome these limitations. Access roads should have adequate cut-slope grade and be provided with drains to control surface runoff. Capability subclass VIIe.

77—Rock outcrop-Coldcreek-Tolman complex, 9 to 90 percent slopes. This strongly sloping to extremely steep complex is on mountains. The average annual precipitation is about 20 inches, and the average annual air temperature is about 42 degrees F.

Rock outcrop makes up about 30 percent of the complex, the Coldcreek soil about 30 percent, the Tolman soil about 20 percent, and other soils about 20 percent.

Included with this complex in mapping are areas of Kutler-Broadmoor-Rock outcrop complex, 25 to 90 percent slopes; Fortwingate-Rock outcrop complex, 15 to 60 percent slopes; and Nederland cobbly sandy loam, 9 to 25 percent slopes. Areas of talus occur below some areas of Rock outcrop.

Rock outcrop occurs throughout the complex. It is most commonly on the upper part of the slopes. Runoff is rapid.

The Coldcreek soil is deep and well drained. It formed in mixed, acid igneous material. Typically, the surface layer is dark gray cobbly loam about 6 inches thick. The subsurface layer is light gray extremely cobbly sandy loam that is mixed with a lesser amount of brown clay loam and is about 25 inches thick. The subsoil is brown extremely cobbly clay loam that has coatings of light gray and is about 12 inches thick. Hard fractured bedrock is at a depth of about 43 inches.

Permeability of the Coldcreek soil is moderate. Effective rooting depth is 40 inches or more. Available water capacity is moderate. Surface runoff is medium, and the hazard of erosion is moderate.

The Tolman soil is shallow and well drained. It formed in medium textured residuum derived from acid igneous rock. Typically, the surface layer is dark grayish brown gravelly sandy loam about 4 inches thick. The subsoil is brown very cobbly sandy clay loam about 9 inches thick. Hard igneous bedrock is at a depth of 13 inches.

Permeability of the Tolman soil is moderate. Effective rooting depth is 10 to 20 inches. Available water capacity is low. Surface runoff is medium, and the hazard of erosion is moderate.

The Coldcreek soil is used mainly for woodland, recreation, and wildlife habitat and as a source of gravel. The Tolman soil is used mainly as rangeland and for wildlife habitat.

The Coldcreek soil is suited to the production of Douglas-fir. It is capable of producing about 690 cubic feet, or 1,000 board feet (International rule), of merchantable timber per acre from a fully stocked, even-aged stand of 80-year-old trees. The main limitations for its use for timber production are slope, hazard of erosion, and the presence of stones on the surface. The stones can hinder felling, yarding, and other operations involving the use of equipment. Practices must be used to minimize erosion when harvesting timber.

The Tolman soil is suited to vegetation suitable for grazing and to the production of some firewood. Rangeland vegetation is mainly mountain muhly, big bluestem, little bluestem, side-oats grama, and western wheatgrass. The common shrubs and trees are mountainmahogany, skunkbush sumac, and Rocky Mountain juniper. There are lesser amounts of ponderosa pine.

Proper range management is necessary on the Tolman soil. Properly locating livestock watering facilities helps to control grazing. Deferment of grazing helps to maintain vigor and production of plants.

The Coldcreek soil is suited to habitat suitable for woodland wildlife, especially mule deer, wild turkey, and blue grouse. To encourage wild turkey in areas where there is little or no water, wildlife watering facilities, such as guzzlers, can be developed. Because of the steep slopes, livestock grazing should be discouraged, which would benefit the wildlife that use these areas.

Rangeland wildlife, such as antelope, cottontail, coyote, and scaled quail, is best adapted for life on the Tolman soil. Forage production is typically low, and proper livestock grazing management is necessary if wildlife and livestock share the range. Livestock watering developments are needed, and they are used by various wildlife species.

The main limitations of the soils of this complex for urban use or homesite development are rock outcrops, stones, depth to bedrock, especially on the Tolman soil, and steep slope. Homesites should be located in places where these limitations are the least severe. Special designs for buildings and roads are required to overcome these limitations. Capability subclass VIIe.

78—Sampson loam, 0 to 3 percent slopes. This deep, well drained soil formed in alluvium derived from sedimentary rock on terraces and alluvial fans and in small closed basins. Elevation ranges from about 5,500 to 6,500 feet. The average annual precipitation is about 14 inches, the average annual air temperature is about 48 degrees F, and the average frost-free period is about 145 days.

Typically, the surface layer is dark grayish brown loam about 6 inches thick. The subsoil, about 44 inches thick, is dark brown to brown clay loam that grades to light brownish gray sandy clay loam in the lower part. The substratum is light brownish gray sandy clay loam to a

depth of 60 inches. The lower part of the subsoil and the substratum have visible soft masses of lime.

Included with this soil in mapping are small areas of Bresser sandy loam, 0 to 3 percent slopes; Nunn clay loam, 0 to 3 percent slopes; and Olney sandy loam, 0 to 3 percent slopes. Also included are areas of Vona sandy loam, 1 to 3 percent slopes, and Ustic Torrifluvents, loamy.

Permeability of this Sampson soil is moderate. Effective rooting depth is 60 inches or more. Available water capacity is high. Surface runoff is slow, and the hazard of erosion is slight.

About one-third of the acreage of this soil is used for irrigated corn and alfalfa and for dryfarmed wheat. The slow surface runoff and slight hazard of erosion reduce the need for use of intensive conservation practices. Most of the remaining acreage is used as rangeland.

This soil is well suited to the production of native vegetation suitable for grazing. Native vegetation is mainly blue grama, western wheatgrass, side-oats grama, sand dropseed, and galleta. Needleandthread, big bluestem, and native bluegrasses are also present where this soil occurs in the northern part of the survey area.

Fencing and properly locating livestock watering facilities help to control grazing. Deferment of grazing may be necessary to maintain a needed balance between livestock demands and forage production. In areas where the plant cover has been depleted, pitting can be used to help the native vegetation recover. Chemical control may be needed in disturbed areas where dense stands of pricklypear occur. Ample amounts of litter and forage should be left on the soil because of the high hazard of soil blowing.

Windbreaks and environmental plantings generally are well suited to this soil. Summer fallow a year prior to planting and continued cultivation for weed control are needed to insure the establishment and survival of plantings. Trees that are best suited and have good survival are Rocky Mountain juniper, eastern redcedar, ponderosa pine, Siberian elm, Russian-olive, and hackberry. Shrubs that are best suited are skunkbush sumac, lilac, Siberian peashrub, and American plum.

This soil is best suited to habitat for openland and rangeland wildlife. In cropland areas, habitat favorable for ring-necked pheasant, mourning dove, and many nongame species can be developed by establishing areas for nesting and escape cover. For pheasant, undisturbed nesting cover is vital and should be provided for in plans for habitat development. This is especially true in areas of intensive farming. Rangeland wildlife, such as pronghorn antelope, can be encouraged by developing livestock watering facilities, properly managing livestock grazing, and reseeding range where needed.

The main limitations of this soil for homesites or urban use are limited ability to support a load, the shrink-swell potential of the subsoil, and frost-action potential. Special designs for buildings and roads and streets are necessary to overcome these limitations. Capability subclasses IVe, nonirrigated, and IIe, irrigated.

79—Satanta loam, 0 to 3 percent slopes. This deep, well drained soil formed in loamy eolian material derived from mixed sources on uplands. Elevation ranges from 5,900 to 6,500 feet. The average annual precipitation is about 15 inches, the average annual air temperature is about 47 degrees F, and the average frost-free period is about 145 days.

Typically, the surface layer is brown loam about 4 inches thick. The lower part of the subsoil has visible soft masses of lime. The subsoil is brown clay loam about 35 inches thick. The substratum is pale brown silt loam to a depth of 60 inches or more.

Included with this soil in mapping are small areas of Ascalon sandy loam, 1 to 3 percent slopes; Bresser sandy loam, 0 to 3 percent slopes; and Wiley silt loam, 1 to 3 percent slopes.

Permeability of this Satanta soil is moderate. Effective rooting depth is 60 inches or more. Available water capacity is high. Surface runoff is slow, and the hazard of erosion is slight.

Most areas of this soil in the northeastern part of the survey area are cultivated. Most areas in the southwestern part are used as rangeland, for wildlife habitat, and for military maneuvers.

Wheat, fallow, and feed grains are used in a flexible cropping system because precipitation is insufficient for annual cropping. Minimum tillage and crop residue management usually are adequate to control erosion. This soil is one of the best in the survey area.

This soil is well suited to native vegetation suitable for grazing. The native vegetation is mainly western wheatgrass, needlegrasses, side-oats grama, and blue grama. If the range has deteriorated, blue grama, junegrass, and native bluegrasses increase. Sleepygrass and annuals replace these grasses if the range has seriously deteriorated.

Seeding is a good practice if the range is in poor condition. Seeding of the native vegetation is desirable, but the range can also be seeded with tame species of grass such as Nordan crested wheatgrass, Russian wildrye, pubescent wheatgrass, or intermediate wheatgrass. Use of deferred grazing and other good range management practices helps to maintain vigor and growth of plants. Fencing and properly locating livestock watering facilities help to control grazing.

Windbreaks and environmental plantings generally are well suited to this soil. Summer fallow a year prior to planting and continued cultivation for weed control are needed to insure the establishment and survival of plantings. Trees that are best suited and have good survival are Rocky Mountain juniper, eastern redcedar, ponderosa pine, Siberian elm, Russian-olive, and hackberry. Shrubs that are best suited are skunkbush sumac, lilac, Siberian peashrub, and American plum.

This soil is best suited to habitat for openland and rangeland wildlife. In cropland areas, habitat favorable for ring-necked pheasant, mourning dove, and many nongame species can be developed by establishing areas for nesting

and escape cover. For pheasant, undisturbed nesting cover is vital and should be provided for in plans for habitat development. This is especially true in areas of intensive farming. Rangeland wildlife, such as pronghorn antelope, can be encouraged by developing livestock watering facilities, properly managing livestock grazing, and reseeding range where needed.

The main limitations of this soil for homesite development and urban use are shrink-swell potential and a limited ability to support a load. Buildings and roads and streets should be designed to overcome these limitations. Frost action is also a concern in designing roads and streets. Capability subclass IIIc.

80—Satanta loam, 3 to 5 percent slopes. This deep, well drained soil formed in loamy eolian material derived from mixed sources on uplands. Elevation ranges from 5,900 to 6,500 feet. The average annual precipitation is about 15 inches, the average annual air temperature is about 47 degrees F, and the average frost-free period is about 145 days.

Typically, the surface layer is brown loam about 4 inches thick. The subsoil is brown clay loam about 35 inches thick. The lower part of the subsoil has visible soft masses of lime. The substratum is pale brown silt loam to a depth of 60 inches or more.

Included with this soil in mapping are small areas of Bresser sandy loam, 3 to 5 percent slopes; Wiley silt loam, 3 to 9 percent slopes; and Neville-Rednun complex, 3 to 9 percent slopes.

Permeability of this Satanta soil is moderate. Effective rooting depth is 60 inches or more. Available water capacity is high. Surface runoff is medium, and the hazard of erosion is moderate.

In the northeastern part of the survey area, this soil is under cultivation. Winter wheat is the main crop, and it is grown in rotation with summer fallow because precipitation is not adequate for continuous cropping. Feed grains such as millet and sorghum are substituted for wheat in some years. Crop residue management, minimum tillage, terraces, and stripcropping may be needed to control erosion. Most areas of this soil in the southwestern part of the area are used as rangeland and for wildlife habitat and military maneuvers.

This soil is well suited to native vegetation suitable for grazing. The rangeland vegetation is mainly western wheatgrass, needlegrasses, side-oats grama, and blue grama. If the range has deteriorated, blue grama, junegrass, and native bluegrasses increase. Sleepygrass and annuals replace these grasses if the range has seriously deteriorated.

Seeding is a good practice if the range is in poor condition. Seeding of the native vegetation is desirable, but the range can also be seeded with tame species of grass such as Nordan crested wheatgrass, Russian wildrye, pubescent wheatgrass, or intermediate wheatgrass. Deferment of grazing and other good range management practices help to maintain vigor and production of plants. Fencing and properly locating livestock watering facilities also help to control grazing.

Windbreaks and environmental plantings generally are well suited to this soil. Summer fallow a year prior to planting and continued cultivation for weed control are needed to insure the establishment and survival of plantings. Trees that are best suited and have good survival are Rocky Mountain juniper, eastern redcedar, ponderosa pine, Siberian elm, Russian-olive, and hackberry. Shrubs that are best suited are skunkbush sumac, lilac, Siberian peashrub, and American plum.

This soil is suited to wildlife habitat. It is best suited to habitat for openland and rangeland wildlife. In cropland areas, habitat favorable for ring-necked pheasant, mourning dove, and many nongame species can be developed by establishing areas for nesting and escape cover. For pheasant, undisturbed nesting cover is vital and should be provided for in plans for habitat development. This is especially true in areas of intensive farming. Rangeland wildlife, such as pronghorn antelope, can be encouraged by developing livestock watering facilities, properly managing livestock grazing, and reseeding range where needed.

The main limitations of this soil for homesite development and urban use are shrink-swell potential and limited ability to support a load. Special designs for buildings and roads and streets are needed to overcome these limitations. Roads also need to be designed to overcome the limitation of potential frost heave. Capability subclass IIIe.

81—Satanta-Neville complex, 3 to 8 percent slopes. These soils are gently sloping to moderately sloping on uplands. Elevation ranges from 5,900 to 6,500 feet. The average annual precipitation is about 14 inches, the average annual air temperature is about 47 degrees F, and the average frost-free period is about 140 days.

The Satanta soil makes up about 50 percent of the complex, the Neville soil about 40 percent, and other soils about 10 percent. The Satanta soil is in the more nearly level areas, and the Neville soil is in the more sloping areas.

Included with these soils in mapping are areas of Neville-Rednun complex, 3 to 9 percent slopes; Satanta loam, 0 to 3 percent slopes; and Satanta loam, 3 to 5 percent slopes.

The Satanta soil is deep and well drained. It formed in loamy eolian material derived from mixed sources. Typically, the surface layer is brown loam about 4 inches thick. The subsoil is brown clay loam about 35 inches thick. The lower part of the subsoil has visible soft masses of lime. The substratum is pale brown silt loam to a depth of 60 inches or more.

Permeability of the Satanta soil is moderate. Effective rooting depth is 60 inches or more. Available water capacity is high. Surface runoff is medium, and the hazard of erosion is moderate.

The Neville soil is deep and well drained. It formed in calcareous loamy alluvium weathered from red-bed sandstone and shale. Typically, the surface layer is reddish gray fine sandy loam about 4 inches thick. The underlying

material is reddish brown heavy fine sandy loam about 6 inches thick over light reddish brown loam that extends to a depth of 60 inches or more.

Permeability of the Neville soil is moderate. Effective rooting depth is 60 inches or more. Available water capacity is high. Surface runoff is medium, and the hazard of erosion is moderate. Some gullies have developed along drainageways and trails.

These soils are used as rangeland, for wildlife habitat, and for military maneuvers.

These soils produce mainly midgrasses, dominantly western wheatgrass. Needlegrasses, big bluestem, sideoats grama, blue grama, and native bluegrasses make up a high percentage of the total production. If the range has deteriorated, blue grama, junegrass, and native bluegrasses increase. Sleepygrass and annuals replace these grasses if the range has seriously deteriorated. Death of livestock that eat poisonous plants increases as the range deteriorates.

Proper range management helps to maintain the vigor and production of plants. Proper location of livestock watering facilities helps to control grazing. Seeding is a good practice if the range is in poor condition. Seeding of the native vegetation is desirable, but the range can also be seeded with tame species of grasses such as Nordan crested wheatgrass, Russian wildrye, pubescent wheatgrass, or intermediate wheatgrass.

Windbreaks and environmental plantings generally are well suited to these soils. Summer fallow a year prior to planting and continued cultivation for weed control are needed to insure the establishment and survival of plantings. Trees that are best suited and have good survival are Rocky Mountain juniper, eastern redcedar, ponderosa pine, Siberian elm, Russian-olive, and hackberry. Shrubs that are best suited are skunkbush sumac, lilac, Siberian peashrub, and American plum.

These soils are suited to wildlife habitat. They are best suited to habitat for openland and rangeland wildlife. In cropland areas, habitat favorable for ring-necked pheasant, mourning dove, and many nongame species can be developed by establishing areas for nesting and escape cover. For pheasant, undisturbed nesting cover is vital and should be provided for in plans for habitat development. Rangeland wildlife, such as pronghorn antelope, can be encouraged by developing livestock watering facilities, properly managing livestock grazing, and reseeding range where needed.

The main limitations for construction on these soils are low bearing strength, shrink-swell potential, and frost action potential. Special designs for buildings and roads are needed. Access roads must have adequate cut-slope grade, and drains should be provided to control surface runoff and keep soil losses to a minimum. Capability subclass IVe.

82—Schamber-Razor complex, 8 to 50 percent slopes. These gently rolling to steep soils are on eroded breaks and remnants of granite outwash over shale. Elevation ranges from 5,500 to 6,500 feet. The average annual precipitation is about 13 inches, and the average annual air temperature is about 49 degrees F.

The Schamber soil makes up about 40 percent of the complex, the Razor soil about 30 percent, and other soils about 30 percent.

Included with these soils in mapping are areas of Chaseville-Midway complex; Kim loam, 1 to 8 percent slopes; Razor stony clay loam, 5 to 15 percent slopes; and Heldt clay loam, 0 to 3 percent slopes.

The Schamber soil is deep and well drained. It formed in eolian material mixed with alluvium and colluvium derived from granite. Typically, the surface layer is grayish brown gravelly loam about 5 inches thick. The underlying material is brown very gravelly loam about 9 inches thick over light yellowish brown very gravelly sand that extends to a depth of 60 inches or more.

Permeability of the Schamber soil is rapid. The effective rooting depth is 60 inches or more, and available water capacity is low to moderate. Surface runoff is medium to rapid, and the hazard of erosion is moderate.

The Razor soil is moderately deep and well drained. It formed in residuum derived from calcareous shale. Slope is 8 to 15 percent. Typically, the surface layer is light brownish gray clay loam about 3 inches thick. The subsoil is grayish brown heavy clay loam or clay about 15 inches thick. The substratum is grayish brown clay that grades to calcareous shale at a depth of about 31 inches. Visible lime is in the lower part of the subsoil and in the substratum.

Permeability of the Razor soil is slow. The effective rooting depth is 20 to 40 inches. Available water capacity is moderate. Surface runoff is medium to rapid, and the hazard of erosion is moderate to high.

The soils in this complex are used as native rangeland, for wildlife habitat, and as military impact areas.

These soils are suited to the production of native vegetation suitable for grazing. Native vegetation on the Schamber soil is western wheatgrass, blue grama, sideoats grama, and little bluestem. The common shrubs are skunkbush sumac, fourwing saltbush, and buckwheat. Native vegetation on the Razor soil is alkali sacaton, western wheatgrass, galleta, and lesser amounts of blue grama. Fourwing saltbush is a common shrub. The presence of princesplume, two-groove milkvetch, and Fremont goldenweed indicates that selenium-bearing plants are in the stand.

These soils are very difficult to revegetate, and it is especially important that livestock grazing be carefully managed. Fencing and properly locating livestock watering facilities help to control grazing. Where the plant cover has been depleted, especially on the Razor soil, pitting aids in the recovery of the native vegetation.

Windbreaks and environmental plantings are suited to this soil. Low available water capacity is the main limitation for the establishment of tree and shrub plantings. Summer fallow a year in advance and continued cultivation for weed control are needed to insure the establishment and survival of plantings. Supplemental irrigation

may be needed to insure survival. Trees that are best suited and have good survival are Rocky Mountain juniper, eastern redcedar, ponderosa pine, and Siberian elm. Shrubs that are best suited are skunkbush sumac and lilac.

These soils are poorly suited to wildlife habitat. They are typically used as habitat for rangeland wildlife, such as scaled quail and antelope. Livestock grazing must be very carefully managed if wildlife is to satisfy most of its habitat requirements.

The main limitation for construction on the Schamber soil is steep slopes. Because of rapid permeability, there is a hazard of pollution if this soil is used for septic tank absorption fields. The high content of coarse fragments may cause problems with excavations, mainly because cut banks cave in. Special designs for buildings and roads are necessary to offset the limitation of slope. The Razor soil is limited by depth to shale, slow permeability, limited ability to support a load, shrink-swell potential, and slope. Both soils are limited by frost-action potential. Special designs for buildings and roads are needed to overcome these limitations. Capability subclass VIIe.

83—Stapleton sandy loam, 3 to 8 percent slopes. This deep, noncalcareous, well drained soil formed in sandy alluvium derived from arkosic bedrock on uplands. Elevation ranges from 6,500 to 7,300 feet. The average annual precipitation is about 15 inches, the average annual air temperature is about 47 degrees F, and the average frost-free period is about 135 days.

Typically, the surface layer is grayish brown sandy loam about 11 inches thick. The subsoil is grayish brown gravelly sandy loam about 6 inches thick. The substratum extends to a depth of 60 inches or more. It is pale brown gravelly sandy loam in the upper part and grades to gravelly loamy sand in the lower part.

Included with this soil in mapping are small areas of Louviers silty clay loam, 3 to 18 percent slopes; Blakeland loamy sand, 1 to 9 percent slopes; Columbine gravelly sandy loam, 0 to 3 percent slopes; and Fluvaquentic Haplaquolls, nearly level. Also included are areas where arkose beds of sandstone and shale are at a depth of 0 to 40 inches. Included areas make up about 20 percent of the mapped acreage.

Permeability of this Stapleton soil is rapid. Effective rooting depth is 60 inches or more. Available water capacity is moderate. Surface runoff is slow, and the hazards of erosion and soil blowing are moderate.

This soil is used as rangeland, for wildlife habitat, and as homesites.

Native vegetation is mainly western wheatgrass, sideoats grama, needleandthread, and little bluestem. The predominant shrub on this soil is true mountainmahogany. Yucca occurs in some areas.

Deferred grazing late in summer and in fall improves the condition of the range. Properly locating livestock watering facilities helps to control grazing.

Windbreaks and environmental plantings are generally suited to this soil. Soil blowing is the principal limitation for the establishment of trees and shrubs. This limitation can be overcome by cultivating only in the tree rows and leaving a strip of vegetation between the rows. Supplemental irrigation may be needed when planting and during dry periods. Trees that are best suited and have good survival are Rocky Mountain juniper, eastern redcedar, ponderosa pine, Siberian elm, Russian-olive, and hackberry. Shrubs that are best suited are skunkbush sumac, lilac, and Siberian peashrub.

This soil is suited to habitat for openland and rangeland wildlife. Rangeland wildlife, such as pronghorn antelope, can be encouraged by developing livestock watering facilities, properly managing livestock grazing, and reseeding range where needed.

The main limitation of this soil for urban use is frost-action potential. Special design of roads and streets is necessary to minimize frost heave damage. Special practices must be provided to minimize water erosion and soil blowing on construction sites where vegetation has been removed. Access roads must have adequate cut-slope grade and be provided with drains to control surface runoff. Capability subclass IVe.

84—Stapleton sandy loam, 8 to 15 percent slopes. This deep, noncalcareous, well drained soil formed in sandy alluvium derived from arkosic bedrock on uplands. Elevation ranges from 6,500 to 7,300 feet. The average annual precipitation is about 15 inches, the average annual air temperature is about 47 degrees F, and the average frost-free period is about 135 days.

Typically, the surface layer is grayish brown sandy loam about 11 inches thick. The subsoil is grayish brown gravelly sandy loam about 6 inches thick. The substratum extends to a depth of 60 inches or more. It is pale brown gravelly sandy loam in the upper part and grades to gravelly loamy sand in the lower part.

Included with this soil in mapping are small areas of Bresser sandy loam, 5 to 9 percent slopes; Louviers silty clay loam, 3 to 18 percent slopes; Truckton sandy loam, 3 to 9 percent slopes; Yoder gravelly sandy loam, 1 to 8 percent slopes; and small outcrops of arkose beds of sandstone and shale.

Permeability of this Stapleton soil is rapid. Effective rooting depth is 60 inches or more. Available water capacity is moderate. Surface runoff is medium, and the hazard of erosion is moderate.

This soil is used as range, for wildlife habitat, and as homesites.

Native vegetation is mainly western wheatgrass, sideoats grama, needleandthread, and little bluestem. The dominant shrub on this soil is true mountainmahogany. Yucca is present in some places.

Deferred grazing late in summer and early in fall improves the condition of the range. Properly locating livestock watering facilities helps to control grazing.

Windbreaks and environmental plantings generally are suited to this soil. Soil blowing is the main limitation for the establishment of trees and shrubs. This limitation can be overcome by cultivating only in the tree rows and

leaving a strip of vegetation between the rows. Supplemental irrigation may be needed when planting and during dry periods. Trees that are best suited and have good survival are Rocky Mountain juniper, eastern redcedar, ponderosa pine, Siberian elm, Russian-olive, and hackberry. Shrubs that are best suited are skunkbush sumac, lilac, and Siberian peashrub.

This soil is suited to wildlife habitat. It is best suited to habitat for openland and rangeland wildlife. Rangeland wildlife, such as pronghorn antelope, can be encouraged by developing livestock watering facilities, properly managing livestock grazing, and reseeding range where needed.

The main limitations of this soil for urban use are potential frost action and slope. Buildings and roads must be designed to overcome these limitations. Erosion control practices are needed to minimize soil blowing and water erosion on construction sites where the vegetation has been removed. Capability subclass VIe.

85—Stapleton-Bernal sandy loams, 3 to 20 percent slopes. These gently sloping to moderately steep soils are on upland ridges and hills. Elevation ranges from about 6,500 to 6,800 feet. The average annual precipitation is about 15 inches, the average annual air temperature is about 47 degrees F, and the average frost-free period is about 135 days.

The Stapleton soil makes up about 40 percent of the complex, the Bernal soil about 30 percent, and included soils about 30 percent.

Included with these soils in mapping are areas of Blakeland loamy sand, 1 to 9 percent slopes; Louviers silty clay loam, 3 to 18 percent slopes; Travessilla-Rock outcrop complex, 8 to 90 percent slopes; Truckton sandy loam, 3 to 9 percent slopes; and small outcrops of arkose sandstone and shale.

The Stapleton soil is commonly on the lower part of slopes. It is deep and well drained. It formed in sandy alluvium derived from arkosic bedrock. Typically, the surface layer is grayish brown sandy loam about 11 inches thick. The subsoil is grayish brown gravelly sandy loam about 6 inches thick. The substratum extends to a depth of 60 inches or more. It is pale brown gravelly sandy loam in the upper part and grades to gravelly loamy sand in the lower part.

Permeability of the Stapleton soil is rapid. Effective rooting depth is 60 inches or more. Available water capacity is moderate. Surface runoff is medium, and the hazard of erosion is moderate.

The Bernal soil is commonly on ridges and hills. It is shallow and well drained. It formed in material weathered from sandstone and modified by eolian sediment. Typically, the surface layer is dark grayish brown sandy loam about 4 inches thick. The subsoil is brown sandy clay loam about 7 inches thick. The substratum is brown sandy loam about 2 inches thick. Hard, light colored sandstone is at a depth of about 13 inches.

Permeability of the Bernal soil is moderate. Effective rooting depth is 8 to 20 inches. Available water capacity is low. Surface runoff is medium, and the hazard of erosion is moderate.

The soils in this complex are used for grazing livestock, for wildlife habitat, and as homesites.

The native vegetation on the Stapleton soil is mainly western wheatgrass, side-oats grama, needleandthread, and little bluestem. The dominant shrub on this soil is true mountainmahogany. Yucca is present in some places.

The native vegetation on the Bernal soil is mainly blue grama, side-oats grama, western wheatgrass, Scribner needlegrass, and needleandthread. The dominant shrubs and trees are mountainmahogany, skunkbush sumac, and one-seeded juniper. There are lesser amounts of pinyon pine.

Deferred grazing late in summer and early in fall improves the condition of the range on the Stapleton soil. Careful management of plant cover is essential because of the difficulty of vegetating the Bernal soil. Properly locating livestock watering facilities helps to control grazing.

Windbreaks and environmental plantings generally are suited to the Stapleton soil. Soil blowing is the main limitation for the establishment of trees and shrubs. This limitation can be overcome by cultivating only in the tree rows and leaving a strip of vegetation between the rows. Supplemental irrigation may be needed when planting and during dry periods. Trees that are best suited and have good survival are Rocky Mountain juniper, eastern redcedar, ponderosa pine, Siberian elm, Russian-olive, and hackberry. Shrubs that are best suited are skunkbush sumac, lilac, and Siberian peashrub.

Windbreaks and environmental plantings generally are not suited to the Bernal soil. Onsite investigation is needed to determine if plantings are feasible.

Rangeland wildlife, such as antelope, cottontail, coyote, and scaled quail, is best adapted for life on the soils in this complex. Proper livestock grazing management is necessary if wildlife and livestock share the range. Livestock watering developments are also important, and they are used by various wildlife species.

The main limitations of the Stapleton soil for urban use are frost-action potential and slope. The main limitations of the Bernal soil are depth to bedrock, frost-action potential, and slope. Special designs for sites, buildings, and roads and streets are needed to control soil blowing and water erosion on construction sites where vegetation has been removed. Capability subclass VIe.

86—Stoneham sandy loam, 3 to 8 percent slopes. This deep, well drained soil formed in medium textured, calcareous sediment on uplands. Elevation ranges from 5,100 to 6,500 feet. The average annual precipitation is about 14 inches, the average annual air temperature is about 49 degrees F, and the average frost-free period is about 145 days.

Typically, the surface layer is pale brown sandy loam about 4 inches thick. The subsoil is pale brown sandy clay loam about 7 inches thick. The substratum is very pale brown loam to a depth of 60 inches. The lower part of the

subsoil and the substratum have visible soft masses of lime.

Included with this soil in mapping are small areas of Fort Collins loam, 0 to 3 percent slopes; Keith silt loam, 0 to 3 percent slopes; and Wiley silt loam, 1 to 3 percent slopes.

Permeability of this Stoneham soil is moderate. Effective rooting depth is 60 inches or more. Available water capacity is high. Surface runoff is medium, and the hazard of erosion is moderate.

Most areas of this soil are used as rangeland, but a few small areas are used for sorghum. This soil is also used for wildlife habitat.

This soil is suited to the production of native vegetation suitable for grazing. The rangeland vegetation is mainly blue grama, which has a typical bunchgrass growth form and makes up one-third to one-half of the cover. Other species are sand dropseed, needleandthread, side-oats grama, and buckwheat. Western wheatgrass, little bluestem, and junegrass are also present where this soil occurs in the northern part of the survey area.

Seeding is a good practice if the range has deteriorated. Native grasses should be used. If the range is severely eroded and blowouts have developed, fertilizing the new seeding is a good practice.

Brush control and grazing management help to improve the depleted range. Grazing should be managed so that enough forage is left standing to protect the soil from blowing, to increase the infiltration of water, and to catch and hold snow.

Windbreaks and environmental plantings are generally well suited to this soil. Summer fallow a year prior to planting and continued cultivation for weed control are needed to insure establishment and survival of plantings. Trees that are best suited and have good survival are Rocky Mountain juniper, eastern redcedar, ponderosa pine, Siberian elm, Russian-olive, and hackberry. Shrubs that are best suited are skunkbush sumac, lilac, Siberian peashrub, and American plum.

This soil is suited to wildlife habitat. It is best suited to habitat for openland and rangeland wildlife. In cropland areas, habitat favorable for ring-necked pheasant, mourning dove, and many nongame species can be developed by establishing areas for nesting and escape cover. For pheasant, undisturbed nesting cover is vital and should be provided for in plans for habitat development. Rangeland wildlife, such as pronghorn antelope, can be encouraged by developing livestock watering facilities, properly managing livestock grazing, and reseeding range where needed.

This soil is well suited to urban development. The main limitation for roads and streets is potential frost-heave damage. Access roads must be designed to minimize this limitation. Capability subclass VIe.

87—Stoneham sandy loam, 8 to 15 percent slopes. This deep, well drained soil formed in medium textured, calcareous sediment on uplands. Elevation ranges from 5,100 to 6,500 feet. The average annual precipitation is about 14 inches, the average annual air temperature is about 49 degrees F, and the average frost-free period is about 145 days.

Typically, the surface layer is pale brown sandy loam about 4 inches thick. The subsoil is pale brown sandy clay loam about 7 inches thick. The substratum is very pale brown loam to a depth of 60 inches or more. The lower part of the subsoil and the substratum have visible soft masses of lime.

Included with this soil in mapping are small areas of Fort Collins loam, 3 to 8 percent slopes; Keith silt loam, 0 to 3 percent slopes; and Wiley silt loam, 3 to 9 percent slopes.

Permeability of this Stoneham soil is moderate. Effective rooting depth is 60 inches or more. Available water capacity is high. Surface runoff is rapid, and the hazard of erosion is moderate. A few gullies have formed along drainageways. Soil slippage is common.

Most areas of this soil are used as rangeland and for wildlife habitat.

This soil is suited to the production of native vegetation suitable for grazing. The native vegetation is mainly blue grama, which has typical bunchgrass growth form and makes up one-third to one-half of the cover. Other species are sand dropseed, needleandthread, side-oats grama, and buckwheat. Western wheatgrass, little bluestem, and junegrass are also present where this soil occurs in the northern part of the survey area.

Seeding is a good practice if the range has deteriorated. Native grasses should be used. If the range is severely eroded and blowouts have developed, fertilizing the new seeding is a good practice. Brush control and grazing management also help to improve the depleted range. Grazing should be managed so that enough forage is left standing to protect the soil from blowing, to increase infiltration of water, and to catch and hold snow.

Windbreaks and environmental plantings generally are well suited to this soil. Summer fallow a year prior to planting and continued cultivation for weed control are needed to insure the establishment and survival of plantings. Trees that are best suited and have good survival are Rocky Mountain juniper, eastern redcedar, ponderosa pine, Siberian elm, Russian-olive, and hackberry. Shrubs that are best suited are skunkbush sumac, lilac, Siberian peashrub, and American plum.

This soil is suited to wildlife habitat. It is best suited to habitat for openland and rangeland wildlife. Rangeland wildlife, such as pronghorn antelope, can be encouraged by developing livestock watering facilities, properly managing livestock grazing, and reseeding range where needed.

The main limitations of this soil for homesites and local roads and streets is potential frost action and slope. Special designs for buildings and roads are needed to overcome these limitations. Access roads should have adequate cut-slope grade and be provided with drains to control surface runoff and thus keep soil losses to a minimum. Capability subclass VIe.

88—**Stroupe-Travessilla-Rock outcrop complex, 9 to 90 percent slopes.** This strongly sloping to extremely steep complex is on foothills and ridges. Elevation ranges from 6,000 to 6,500 feet. The average annual precipitation is about 15 inches, the average annual air temperature is about 47 degrees F, and the average frost-free period is about 145 days. The Stroupe soil makes up about 40 percent of the complex, the Travessilla soil 25 percent, Rock outcrop 20 percent, and other soils 15 percent.

Included with this complex in mapping are areas of Kim, Satanta, and Wiley soils.

The Stroupe soil is moderately deep and well drained. It formed in fine textured residuum derived from sandstone. Typically, the surface layer is dark grayish brown stony loam about 8 inches thick. The subsoil is brown very stony clay loam about 8 inches thick. The substratum is grayish brown very stony clay loam about 19 inches thick. Hard sandstone is at a depth of about 35 inches.

Permeability of the Stroupe soil is slow. Effective rooting depth is 20 to 40 inches. Available water capacity is moderate. Surface runoff is medium, and the hazard of erosion is moderate.

The Travessilla soil is shallow and well drained. It formed in residuum derived from sandstone. Typically, the surface layer is light brownish gray sandy loam about 3 inches thick. The substratum is pale brown sandy loam about 8 inches thick. Hard fractured sandstone is at a depth of about 11 inches.

Permeability of the Travessilla soil is moderately rapid. Effective rooting depth is 6 to 20 inches. Available water capacity is low. Surface runoff is medium to rapid, and the hazard of erosion is high.

Rock outcrop occurs mostly as vertical rock ledges. Stones and cobbles of sandstone are abundant over much of the complex.

This complex is used for woodland, wildlife habitat, and military maneuvers.

The soils in this complex are suited to the production of firewood. They are capable of producing 8 cords per acre in a stand of trees that average 5 inches in diameter at a height of 1 foot. The main limitations for wood crop production are stones on the surface and a high hazard of erosion. Stones on the surface can influence felling, yarding, and other operations involving the use of equipment. Measures that minimize erosion during harvesting are needed. Seedling mortality is severe on the Travessilla soil because of low available water capacity.

This complex is suited to habitat for wildlife such as mule deer and wild turkey. The combination of juniper and pinyon makes this complex attractive for wild turkey, but an inadequate supply of water may limit management for this species. Where surface water is not available, construction of watering facilities, such as guzzlers, can overcome this limitation.

The main limitation of these soils for buildings and roads are depth to bedrock, shrink-swell potential, stones, and slope. Special site or building and road designs are required because of these limitations. Access roads must have adequate cut-slope grade and be provided with drains to control surface runoff. Capability subclass VIIs.

89—**Tassel fine sandy loam, 3 to 18 percent slopes.** This shallow, well drained soil is on upland hills and ridges. It formed in calcareous residuum derived from sandstone. Elevation ranges from 5,600 to 6,400 feet. The average annual precipitation is about 14 inches, the average annual air temperature is about 48 degrees F, and the average frost-free period is about 145 days.

Typically, the surface layer is grayish brown fine sandy loam about 4 inches thick. The substratum is brown fine sandy loam about 3 inches thick over pale brown sandy loam about 3 inches thick. Sandstone bedrock is at a depth of about 10 inches.

Included with this soil in mapping are small areas of Bresser sandy loam, 3 to 5 percent slopes; Bresser sandy loam, 5 to 9 percent slopes; Nelson-Tassel fine sandy loams, 3 to 18 percent slopes; and Truckton sandy loam, 3 to 9 percent slopes.

Permeability of this Tassel soil is moderately rapid. Effective rooting depth is 10 to 20 inches. Available water capacity is low. Surface runoff is medium, the hazard of erosion is moderate to high, and the hazard of soil blowing is severe.

This soil is used as rangeland and for wildlife habitat.

This soil is suited to the production of native vegetation suitable for grazing. The native vegetation is mainly blue grama that has a typical bunchgrass growth form and makes up one-third to one-half of the cover. Other species are sand dropseed, needleandthread, side-oats grama, and buckwheat.

Seeding is a good practice if the range has deteriorated. Native grasses should be used. If the range is severely eroded and blowouts have developed, fertilizing the new seeding is a good practice. Brush control and grazing management improve the depleted range. Grazing should be managed so that enough forage is left standing to protect the soil from blowing, to increase the infiltration of water, and to catch and hold snow.

Windbreaks and environmental plantings generally are not suited to this soil. Onsite investigation is needed to determine if plantings are feasible.

This soil is very poorly suited to wildlife habitat. It typically produces habitat for rangeland wildlife such as scaled quail and antelope. Extreme care is needed to manage livestock grazing if wildlife is to satisfy most of its habitat requirements on this soil.

The main limitation of this soil for homesites is the shallow depth to bedrock. In most places the use of heavy equipment during site preparation can overcome this limitation. In the steeper areas of this soil, special designs for buildings and roads are required. Erosion control practices are needed on construction sites where the vegetation has been removed. Capability subclass VIe.

90—**Terry sandy loam, 1 to 8 percent slopes.** This moderately deep, well drained soil formed in calcareous residuum derived from sandstone on uplands. Elevation

ranges from 5,600 to 6,500 feet. The average annual precipitation is about 14 inches, the average annual air temperature is about 48 degrees F, and the average frost-free period is about 140 days.

Typically, the surface layer is grayish brown sandy loam about 5 inches thick. The subsoil is grayish brown sandy loam about 11 inches thick. The substratum is light brownish gray sandy loam about 7 inches thick. Weathered sandstone is at a depth of about 23 inches.

Included with this soil in mapping are small areas of Razor clay loam, 3 to 9 percent slopes; Tassel fine sandy loam, 3 to 18 percent slopes; and Truckton sandy loam, 3 to 9 percent slopes.

Permeability of this Terry soil is moderately rapid. Effective rooting depth is 20 to 40 inches. Available water capacity is low. Surface runoff is medium, and the hazard of erosion is moderate.

Almost all areas of this soil are used as rangeland and for wildlife habitat.

This soil is best suited to grasses. Native vegetation is mainly cool- and warm-season grasses such as western wheatgrass, side-oats grama, and needleandthread. Smaller amounts of other grasses, such as little bluestem, junegrass, mountain muhly, and blue grama, are scattered throughout the stand.

Proper range management is necessary to prevent excessive removal of plant cover. Interseeding is used to improve the existing vegetation. Deferment of grazing in spring increases plant vigor and soil stability. Properly locating livestock watering facilities helps to control grazing.

Windbreaks and environmental plantings generally are not suited to this soil. Onsite investigation is needed to determine if plantings are feasible.

Rangeland wildlife, such as pronghorn antelope, can be encouraged by developing livestock watering facilities, properly managing livestock grazing, and reseeding range where needed.

The main limitations of this soil for homesites are depth to sandstone and frost-action potential. Deep cuts, to provide essentially level building sites, can expose the bedrock. Use of heavy equipment minimizes this limitation. Access roads must be designed to minimize frost-heave damage. Septic tank absorption fields do not function properly because of the limited depth to sandstone. Capability subclass VIe.

91—Terry-Razor complex, 3 to 20 percent slopes. These soils are gently sloping to moderately steep. Elevation ranges from 6,200 to 6,500 feet. The average annual precipitation is about 14 inches, the average annual air temperature is about 48 degrees F, and the average frost-free period is about 140 days.

The Terry soil makes up about 50 percent of the complex, the Razor soil about 30 percent, and other soils about 20 percent.

Included with this complex in mapping are areas of Cushman loam, 5 to 15 percent slopes; Midway clay loam, 3 to 25 percent slopes; and Yoder gravelly sandy loam, 8 to 25 percent slopes.

The Terry soil is on ridges and steeper side slopes. It is moderately deep and well drained. It formed in calcareous residuum derived from sandstone. Typically, the surface layer is grayish brown sandy loam about 5 inches thick. The subsoil is grayish brown sandy loam about 11 inches thick. The substratum is light brownish gray sandy loam about 7 inches thick. Weathered sandstone is at a depth of about 23 inches.

Permeability of the Terry soil is moderately rapid. Effective rooting depth is 20 to 40 inches. Available water capacity is low. Surface runoff is medium, and the hazard of erosion is moderate. Soil slippage is common in the steeper areas of this soil.

The Razor soil is on lower side slopes and in less sloping areas. It is moderately deep and well drained. It formed in residuum derived from shale. Typically, the surface layer is light brownish gray clay loam about 3 inches thick. The subsoil is grayish brown heavy clay loam about 15 inches thick. The substratum is grayish brown clay that grades to calcareous shale at a depth of about 31 inches. Soft masses and streaks of lime are in the lower part of the subsoil and in the substratum.

Permeability of the Razor soil is slow. Effective rooting depth is 20 to 40 inches. Available water capacity is moderate. Surface runoff is medium, and the hazard of erosion is moderate. A few gullies have developed in drainageways.

This complex is used as rangeland and for wildlife habitat.

The native vegetation on the Terry soil is mainly cool- and warm-season grasses such as western wheatgrass, side-oats grama, and needleandthread. Small amounts of other grasses, such as little bluestem, junegrass, mountain muhly, and blue grama, are scattered throughout the stand.

Native vegetation on the Razor soil is mainly western wheatgrass, blue grama, alkali sacaton, needleandthread, junegrass, and side-oats grama. The presence of princesplume, two-groove milkvetch, and Fremont goldenweed indicates that selenium-bearing plants are in the stand.

Proper range management is necessary to prevent excessive removal of plant cover from these soils. Interseeding is used on the Terry soil to improve the existing vegetation. Deferment of grazing in spring increases plant vigor and soil stability. Properly locating livestock watering facilities helps to control grazing.

Windbreak and environmental plantings generally are not suited to these soils. Onsite investigation is needed to determine if plantings are feasible.

The soils in this complex are best suited to habitat for openland and rangeland wildlife. Rangeland wildlife, such as pronghorn antelope, can be encouraged by developing livestock watering facilities, properly managing livestock grazing, and reseeding range where needed.

The main limitations of the Terry soil for urban use are depth to weathered sandstone bedrock, frost-action potential, and slope. The main limitations of the Razor soil are depth to shale, shrink-swell potential, and limited bearing

strength. Special designs for buildings and roads are required to offset these limitations. Methods of sewage disposal other than septic tank absorption fields are needed because of the limited depth to bedrock. Capability subclass VIe.

92—Tomah-Crowfoot loamy sands, 3 to 8 percent slopes. These gently sloping to moderately sloping soils are on alluvial fans, hills, and ridges in the uplands. Elevation ranges from about 7,300 to 7,600 feet. The average annual precipitation is about 17 inches, the average annual air temperature is about 42 degrees F, and the average frost-free period is about 120 days.

The Tomah soil makes up about 50 percent of the complex, the Crowfoot soil about 30 percent, and other soils about 20 percent.

Included with these soils in mapping are areas of Elbeth sandy loam, 3 to 8 percent slopes; Kettle gravelly loamy sand, 3 to 8 percent slopes; and Pring coarse sandy loam, 3 to 8 percent slopes.

The Tomah soil is deep and well drained. It formed in alluvium or residuum derived from arkose beds. Typically, the surface layer is dark grayish brown loamy sand about 10 inches thick. The subsurface layer is very pale brown coarse sand about 12 inches thick. The subsoil, about 26 inches thick, is a matrix of very pale brown coarse sand in which are embedded many thin bands and lamellae of pale brown coarse sandy clay loam. The substratum is very pale brown coarse sand to a depth of 60 inches or more.

Permeability of the Tomah soil is moderately rapid. Effective rooting depth is 60 inches or more. Available water capacity is moderate. Surface runoff is slow, and the hazard of erosion is slight to moderate.

The Crowfoot soil is deep and well drained. It formed in sediment weathered from arkosic sandstone. Typically, the surface layer is grayish brown loamy sand about 12 inches thick. The subsurface layer is very pale brown sand about 11 inches thick. The subsoil is light yellowish brown sandy clay loam about 13 inches thick. The substratum is very pale brown coarse sand to a depth of about 68 inches.

Permeability of the Crowfoot soil is moderate. Effective rooting depth is 60 inches or more. Available water capacity is moderate. Surface runoff is slow, and the hazard of erosion is slight to moderate.

This complex is used as rangeland, for wildlife habitat, and as homesites.

Native vegetation is mainly mountain muhly, bluestem, mountain brome, needleandthread, and blue grama. These soils are subject to invasion by Kentucky bluegrass and Gambel oak. Noticeable forbs are hairy goldenrod, geranium, milkvetch, low larkspur, fringed sage, and buckwheat.

Properly locating livestock watering facilities helps to control grazing. Timely deferment of grazing is needed to protect the plant cover.

Windbreaks and environmental plantings are fairly well suited to these soils. Blowing sand and moderate available water capacity are the principal limitations for the establishment of trees and shrubs. The soils are so loose that trees need to be planted in shallow furrows and plant cover needs to be maintained between the rows. Supplemental irrigation may be needed to insure survival. Trees that are best suited and have good survival are Rocky Mountain juniper, eastern redcedar, ponderosa pine, and Siberian elm. Shrubs that are best suited are skunkbush sumac, lilac, and Siberian peashrub.

These soils are best suited to habitat for openland wildlife such as pronghorn antelope and sharp-tailed grouse. Although sharp-tailed grouse are not plentiful, they could be encouraged on these soils, especially where brush species are interspersed with grasses and forbs. If these soils are used as rangeland, wildlife production can be increased by managing livestock grazing to preclude overuse of the more desirable grass species and depletion of the various brush species.

These soils have good potential for use as homesites. The main limitation of the Crowfoot soil is frost-action potential. Roads and streets need to be designed to minimize frost-heave damage. Maintaining the existing vegetation on building sites during construction helps to control erosion. Capability subclass IVe.

93—Tomah-Crowfoot loamy sands, 8 to 15 percent slopes. These moderately sloping to strongly sloping soils are on alluvial fans, hills, and ridges in the uplands. Elevation ranges from about 7,300 to 7,600 feet. The average annual precipitation is about 17 inches, the average annual air temperature is about 42 degrees F, and the average frost-free period is about 120 days.

The Tomah soil makes up about 50 percent of the complex, the Crowfoot soil about 30 percent, and other soils about 20 percent.

Included with these soils in mapping are areas of Elbeth sandy loam, 8 to 15 percent slopes; Peyton-Pring complex, 8 to 15 percent slopes; and Kettle gravelly loamy sand, 8 to 40 percent slopes.

The Tomah soil is deep and well drained. It formed in alluvium or residuum derived from arkose beds. Typically, the surface layer is dark grayish brown loamy sand about 10 inches thick. The subsurface layer is very pale brown coarse sand about 12 inches thick. The subsoil, about 26 inches thick, consists of a matrix of very pale brown coarse sandy clay loam. The substratum is very pale brown coarse sand to a depth of 60 inches or more.

Permeability of the Tomah soil is moderately rapid. Effective rooting depth is 60 inches or more. Available water capacity is moderate. Surface runoff is medium, and the hazard of erosion is moderate. Some gullies are present in some drainageways and along stock trails.

The Crowfoot soil is deep and well drained. It formed in sediment weathered from arkosic sandstone. Typically, the surface layer is grayish brown loamy sand about 12 inches thick. The subsurface layer is very pale brown sand about 11 inches thick. The subsoil is light yellowish brown sandy clay loam about 13 inches thick. The substratum is very pale brown coarse sand to a depth of about 68 inches.

Permeability of the Crowfoot soil is moderate. Effective rooting depth is 60 inches or more. Available water capacity is moderate. Surface runoff is medium, and the hazard of erosion is moderate. Some gullies are present in some drainageways and along stock trails.

The soils in this complex are used as rangeland, for recreation and wildlife habitat, and as homesites.

Native vegetation is mainly mountain muhly, bluestem, mountain brome, needleandthread, and blue grama. These soils are subject to invasion by Kentucky bluegrass and Gambel oak. Noticeable forbs are hairy goldenrod, geranium, milkvetch, low larkspur, fringed sage, and buckwheat.

Proper location of livestock watering facilities helps to control grazing. Timely deferment of grazing is needed to protect the plant cover.

Windbreaks and environmental plantings are fairly well suited to these soils. Blowing sand and moderate available water capacity are the main limitations for the establishment of trees and shrubs. The soils are so loose that trees need to be planted in shallow furrows and plant cover needs to be maintained between the rows. Supplemental irrigation may be needed to insure survival. Trees that are best suited and have good survival are Rocky Mountain juniper, eastern redcedar, ponderosa pine, and Siberian elm. Shrubs that are best suited are skunkbush sumac, lilac, and Siberian peashrub.

These soils are best suited to habitat for openland wildlife species, such as pronghorn antelope and sharp-tailed grouse. Although sharp-tailed grouse are not plentiful, they could be encouraged on these soils, especially where brush species are interspersed with grasses and forbs. If these soils are used as rangeland, wildlife production can be increased by managing livestock grazing to preclude overuse of the more desirable grass species and depletion of the various brush species.

The main limitations for urban uses are frost-action potential and slope on the Crowfoot soil and slope on the Tomah soil. Buildings and roads must be designed to overcome these limitations. Access roads must have adequate cut-slope grade and be provided with drains to control surface runoff. Maintaining the existing vegetation on building sites during construction helps to control erosion. Capability subclass VIe.

94—Travessilla-Rock outcrop complex, 8 to 90 percent slopes. This moderately sloping to extremely steep complex is mostly on rocky uplands (fig. 5). Elevation ranges from 6,200 to 6,700 feet. The average annual precipitation is about 15 inches, the average annual air temperature is about 47 degrees F, and the average frost-free period is about 140 days.

The Travessilla soil makes up about 45 percent of the complex, Rock outcrop about 30 percent, and included areas about 25 percent.

Included with this complex in mapping are areas of Bresser sandy loam, 5 to 9 percent slopes, Elbeth sandy loam, 8 to 15 percent slopes, Kettle gravelly loamy sand, 8 to 40 percent slopes, and Louviers silty clay loam, 3 to 18 percent slopes. The Elbeth and Kettle soils commonly are on the north-facing slopes.

The Travessilla soil is shallow and well drained. It formed in residuum derived from sandstone. Typically, the surface layer is light brownish gray sandy loam about 3 inches thick. The underlying material is pale brown sandy loam about 8 inches thick. Hard arkosic sandstone that has some fractures is at a depth of about 11 inches.

Permeability of the Travessilla soil is moderately rapid. Effective rooting depth is 6 to 20 inches. Available water capacity is low. Surface runoff is medium to rapid, and the hazard of erosion is high. Gullies are common along drainageways and trails.

Rock outcrop occurs mostly as ledges on cliffs.

This complex is used for urban development, as homesites, and for recreation and wildlife habitat.

This complex is suited to the production of ponderosa pine. The main limitations are the presence of stones and rock outcrop on the surface and a high hazard of erosion. Stones on the surface can hinder felling, yarding, and other operations involving the use of equipment. Practices must be used to minimize soil erosion when harvesting timber. The low available water capacity can influence seedling survival.

Wildlife on these soils is limited mostly to small animals such as cottontail, squirrel, and birds because of the extent of urban development. Ponderosa pine, mountain-mahogany, Gambel oak, and various grasses provide food, cover, and nesting areas.

This complex is extensively used for urban development and as homesites (fig. 6). The main limitations for these uses are depth to bedrock, rock outcrop, and steep slopes. Septic tank absorption fields do not function properly because of the depth to bedrock. Special designs for buildings and roads and streets are needed to overcome the limitations. Plans for homesite development should provide for the preservation of as many trees as possible because of their esthetic value. Capability subclass VIIe.

95—Truckton loamy sand, 1 to 9 percent slopes. This deep, well drained soil formed in alluvium and residuum derived from arkosic sedimentary rock on uplands. Elevation ranges from 6,000 to 7,000 feet. The average annual precipitation is about 15 inches, the average annual air temperature is about 47 degrees F, and the average frost-free period is about 135 days.

Typically, the surface layer is grayish brown loamy sand about 8 inches thick. The subsoil is brown sandy loam about 18 inches thick. The substratum is light yellowish brown coarse sandy loam to a depth of 60 inches or more.

Included with this soil in mapping are small areas of Blakeland loamy sand, 1 to 9 percent slopes; Bresser sandy loam, 3 to 5 percent sloeps; Bresser sandy loam, 5 to 9 percent slopes; Truckton sandy loam, 0 to 3 percent slopes; and Truckton sandy loam, 3 to 9 percent slopes.

Permeability of this Truckton soil is moderately rapid. Effective rooting depth is 60 inches or more. Available water capacity is moderate. Surface runoff is slow, and the hazard of erosion is moderate to high.

Almost all areas of this soil are used as rangeland. A few areas of crops such as alfalfa and corn are grown under sprinkler irrigation.

This soil is well suited to the production of native vegetation suitable for grazing. It is best suited to deep-rooted grasses. The native vegetation is mainly cool- and warm-season grasses such as western wheatgrass, sideoats grama, and needleandthread.

Proper range management is needed to prevent excessive removal of the plant cover. Interseeding is used to improve the existing vegetation. Deferment of grazing in spring increases plant vigor and soil stability. Properly locating livestock watering facilities helps to control grazing.

Windbreaks and environmental plantings are fairly well suited to this soil. Blowing sand is the main limitation for the establishment of trees and shrubs. The soil is so loose that trees need to be planted in shallow furrows and plant cover needs to be maintained between the rows. Supplemental irrigation may be needed to insure survival. Trees that are best suited and have good survival are Rocky Mountain juniper, eastern redcedar, ponderosa pine, and Siberian elm. Shrubs that are best suited are skunkbush sumac, lilac, and Siberian peashrub.

This soil is suited to wildlife habitat. It is best suited to openland and rangeland wildlife habitat. Rangeland wildlife, such as pronghorn antelope, can be encouraged by developing livestock watering facilities, properly managing livestock grazing, and reseeding range where needed.

This soil has good potential for use as homesites. The main limitation of this soil for roads and streets is frost action potential. Special designs for roads are needed to minimize this limitation. Practices are needed to control soil blowing and water erosion on construction sites where the plant cover has been removed. Capability subclass VIe, nonirrigated.

96—Truckton sandy loam, 0 to 3 percent slopes. This deep, well drained soil formed in alluvium and residuum derived from arkosic sedimentary rock on uplands. Elevation ranges from 6,000 to 7,000 feet. The average annual precipitation is about 15 inches, the average annual air temperatue is about 47 degrees F, and the average frost-free period is about 135 days.

Typically, the surface layer is grayish brown sandy loam about 5 inches thick. The next layer is dark grayish brown sandy loam about 3 inches thick. The subsoil is brown sandy loam about 16 inches thick. The substratum is light yellowish brown coarse sandy loam to a depth of 60 inches or more.

Included with this soil in mapping are small areas of Blakeland loamy sand, 1 to 9 percent slopes; Bresser sandy loam, 0 to 3 percent slopes; Ellicott loamy coarse sand, 0 to 5 percent slopes; and Ustic Torrifluvents, loamy.

Permeability of this Truckton soil is moderately rapid. Effective rooting depth is 60 inches or more. Available water capacity is moderate. Surface runoff is slow, and the hazards of erosion and soil blowing are moderate.

This soil is used mainly for cultivated crops. It is also used for livestock grazing, for wildlife habitat, and as homesites.

Crops are commonly grown in combination with summer fallow because moisture is insufficient for annual cropping. Alfalfa can also be grown on this soil. When this soil is used as cropland, crop residue management and minimum tillage are necessary conservation practices.

This soil is well suited to the production of native vegetation suitable for grazing (fig. 7). It favors deep-rooted grasses. The native vegetation is mainly cool- and warm-season grasses such as western wheatgrass, sideoats grama, and needleandthread.

Proper range management is needed to prevent excessive removal of the plant cover. Interseeding is used to improve the existing vegetation. Deferment of grazing in spring increases plant vigor and soil stability. Properly locating livestock watering facilities helps to control grazing.

Windbreaks and environmental plantings generally are suited to this soil. Soil blowing is the main limitation to the establishment of trees and shrubs. This limitation can be overcome by cultivating only in the tree rows and leaving a strip of vegetation between the rows. Supplemental irrigation may be needed when planting and during dry periods. Trees that are best suited and have good survival are Rocky Mountain juniper, eastern redcedar, ponderosa pine, Siberian elm, Russian-olive, and hackberry. Shrubs that are best suited are skunkbush sumac, lilac, and Siberian peashrub.

This soil is suited to wildlife habitat. It is best suited to habitat for openland and rangeland wildlife. In cropland areas, habitat favorable for ring-necked pheasant, mourning dove, and many nongame species can be developed by establishing areas for nesting and escape cover. For pheasant, undisturbed nesting cover is vital and should be provided in plans for habitat development. This is especially true in areas of intensive farming. Rangeland wildlife, such as pronghorn antelope, can be encouraged by developing livestock watering facilities, properly managing livestock grazing, and reseeding range where needed.

This soil has good potential for use as homesites. The main limitation of this soil for roads and streets is frost-action potential. Special designs for roads are needed to overcome this limitation. Capability subclasses IIIe, nonirrigated, and IIe, irrigated.

97—Truckton sandy loam, 3 to 9 percent slopes. This deep, well drained soil formed in alluvium and residuum derived from arkosic sedimentary rock on uplands. Elevation ranges from 6,000 to 7,000 feet. The average annual precipitation is about 15 inches, the average annual air temperature is about 47 degrees F, and the average frost-free period is about 135 days.

Typically, the surface layer is grayish brown sandy loam about 5 inches thick. The next layer is dark grayish brown sandy loam about 3 inches thick. The subsoil is brown sandy loam about 16 inches thick. The substratum is light yellowish brown coarse sandy loam to a depth of 60 inches or more.

Included with this soil in mapping are small areas of Blakeland loamy sand, 1 to 9 percent slopes; Bresser sandy loam, 3 to 5 percent slopes; and Truckton sandy loam, 0 to 3 percent slopes. Also included are small areas of soils that have arkosic sandstone or shale at a depth of less than 40 inches.

Permeability of this Truckton soil is moderately rapid. Effective rooting depth is 60 inches or more. Available water capacity is moderate. Surface runoff is slow to medium, and the hazards of erosion and soil blowing are moderate.

More than half of this soil is used as rangeland, for wildlife habitat, and as homesites. The rest, consisting of the less sloping areas, is used for wheat and sorghum. Rangeland or pastureland is the most suitable use because the permanent plant cover protects the soil.

This soil is well suited to the production of native vegetation suitable for grazing. Native vegetation is mainly cool- and warm-season grasses such as western wheatgrass, side-oats grama, and needleandthread.

Proper range management is needed to prevent excessive removal of the plant cover from this soil. Interseeding improves the existing vegetation. Deferment of grazing in spring increases plant vigor and soil stability. Properly locating livestock watering facilities helps to control grazing.

Windbreaks and environmental plantings generally are well suited to this soil. Soil blowing is the main limitation to the establishment of trees and shrubs. This limitation can be overcome by cultivating only in the tree rows and leaving a strip of vegetation between the rows. Supplemental irrigation may be needed when planting and during dry periods. Trees that are best suited and have good survival are Rocky Mountain juniper, eastern redcedar, ponderosa pine, Siberian elm, Russian-olive, and hackberry. Shrubs that are best suited are skunkbush sumac, lilac, and Siberian peashrub.

This soil is suited to wildlife habitat. It is best suited to habitat for openland and rangeland wildlife. In cropland areas, habitat favorable for ring-necked pheasant, mourning dove, and many nongame species can be developed by establishing areas for nesting and escape cover. For pheasant, undisturbed nesting cover is vital and should be provided for in plans for habitat development. Rangeland wildlife, such as pronghorn antelope, can be encouraged by developing livestock watering facilities, properly managing livestock grazing, and reseeding range where needed.

The main limitation of this soil for construction is frost-action potential. Special designs for roads are needed to overcome this limitation. Because of the sandy nature of the soil, practices must be provided to minimize surface runoff and thus keep erosion to a minimum. Access roads must have adequate cut-slope grade and be provided with drains to control surface runoff. Capability subclasses VIe, nonirrigated, and IVe, irrigated.

98—Truckton-Blakeland complex, 9 to 20 percent slopes. These strongly sloping to moderately steep soils are on uplands. Elevation ranges from 6,000 to 7,000 feet. The average annual precipitation is about 15 inches, the average annual air temperature is about 47 degrees F, and the average frost-free period is about 135 days.

The Truckton soil makes up about 60 percent of the complex, the Blakeland soil about 25 percent, and other soils about 15 percent.

Included with these soils in mapping are areas of Bresser sandy loam, 5 to 9 percent slopes, and Yoder gravelly sandy loam, 8 to 25 percent slopes.

The Truckton soil is deep and well drained. It formed in alluvium and residuum weathered from arkosic sedimentary rock. Typically, the surface layer is grayish brown sandy loam about 5 inches thick. The next layer is dark grayish brown sandy loam about 3 inches thick. The subsoil is brown sandy loam about 16 inches thick. The substratum is light yellowish brown coarse sandy loam to a depth of 60 inches or more.

Permeability of the Truckton soil is moderately rapid. Effective rooting depth is 60 inches or more. Available water capacity is moderate. Surface runoff is medium to rapid, and the hazard of erosion is moderate to high. Soil slippage is common on the upper part of slopes.

The Blakeland soil is deep and somewhat excessively drained. It formed in arkosic sandy alluvium and eolian sediment derived from arkosic sedimentary rock. Typically, the surface layer is dark grayish brown loamy sand about 11 inches thick. The underlying material is brown loamy sand about 16 inches thick; it grades to pale brown sand that extends to a depth of 60 inches or more.

Permeability of the Blakeland soil is rapid. Effective rooting depth is 60 inches or more. Available water capacity is low to moderate. Surface runoff is medium, and the hazard of erosion is moderate to high, and the hazard of soil blowing is high. Soil slippage is common on the upper part of slopes.

The soils in this complex are used for grazing livestock and wildlife habitat.

These soils are suited to the production of native vegetation suitable for grazing. The native vegetation is dominantly western wheatgrass, side-oats grama, and needleandthread.

Proper range management is needed to prevent excessive removal of the plant cover from these soils. Interseeding improves the existing vegetation. Deferment of grazing in spring improves plant vigor and soil stability. Properly locating livestock watering facilities helps to control grazing.

Soil blowing is the main limitation for the establishment of trees and shrubs on these soils. This limitation can be overcome by cultivating only in the tree rows and leaving a strip of vegetation between the rows. Trees need to be planted in shallow furrows on the Blakeland soil because of its loose, sandy surface layer. Supplemental irrigation may be needed to insure survival. Trees that are best suited and have good survival are Rocky Mountain juniper, eastern redcedar, ponderosa pine, Siberian elm, Russian-olive, and hackberry. Shrubs that are best suited are skunkbush sumac, lilac, and Siberian peashrub.

These soils are well suited to wildlife habitat. They are best suited to habitat for openland and rangeland wildlife. Rangeland wildlife, such as pronghorn antelope, can be encouraged by developing livestock watering facilities, properly managing livestock grazing, and reseeding range where needed.

The main limitation of these soils for homesites is slope. Special designs for buildings and roads are needed to overcome this limitation. Access roads must be designed to minimize frost-heave damage, particularly on the Truckton soil. They must also have adequate cut-slope grade and be provided with drains to control surface runoff and keep soil losses to a minimum. Capability subclass VIe.

99—Truckton-Bresser complex, 5 to 20 percent slopes. These moderately sloping to moderately steep soils are on uplands. Elevation ranges from 6,200 to 6,900 feet. The average annual precipitation is about 15 inches, the average annual air temperature is about 47 degrees F, and the average frost-free period is about 135 days. The Truckton soil makes up about 45 percent of the complex, the Bresser soil about 35 percent, and other soils about 20 percent.

Included with these soils in mapping are areas of Blakeland loamy sand, 1 to 9 percent slopes, Cushman loam, 5 to 15 percent slopes, and Yoder gravelly sandy loam, 8 to 25 percent slopes. Also included on ridges and knobs are soils that have a gravelly and cobbly surface.

The Truckton soil is deep and well drained. It formed in alluvium and residuum derived from arkosic sedimentary rock. Typically, the surface layer is grayish brown sandy loam about 5 inches thick. The next layer is dark grayish brown sandy loam about 3 inches thick. The subsoil is brown sandy loam about 16 inches thick. The substratum is light yellowish brown coarse sandy loam to a depth of 60 inches or more.

Permeability of the Truckton soil is moderately rapid. Effective rooting depth is 60 inches or more. Available water capacity is moderate. Surface runoff is medium to rapid, and the hazard of erosion is moderate to high. Gullies are common along drainageways, and soil slippage is common on the steeper slopes.

The Bresser soil is deep and well drained. It formed in alluvium and residuum derived from arkosic sedimentary rock. Typically, the surface layer is grayish brown sandy loam about 5 inches thick. The subsoil is brown sandy clay loam about 31 inches thick. The substratum is light yellowish brown loamy coarse sand to a depth of 60 inches or more.

Permeability of the Bresser soil is moderate. Effective rooting depth is 60 inches or more. Available water capacity is moderate. Surface runoff is medium, and the hazard of erosion is moderate to high. Gullies have developed along some drainageways, and soil slippage is common on the steeper slopes.

The soils in this complex are used as rangeland and for wildlife habitat.

These soils favor deep-rooted grasses. They are suited to the production of native vegetation suitable for grazing. The native vegetation is dominantly western wheatgrass, side-oats grama, and needleandthread.

Proper range management is necessary to prevent excessive removal of the plant cover from these soils. Interseeding improves the existing vegetation. Deferment of grazing in spring increases plant vigor and soil stability. Properly locating livestock watering facilities helps to control grazing.

Windbreaks and environmental plantings generally are suited to these soils. Soil blowing is the main limitation for the establishment of trees and shrubs. This limitation can be overcome by cultivating only in the tree rows and leaving a strip of vegetation between the rows. Supplemental irrigation may be needed when planting and during dry periods. Trees that are best suited and have good survival are Rocky Mountain juniper, eastern redcedar, ponderosa pine, Siberian elm, Russian-olive, and hackberry. Shrubs that are best suited are skunkbush sumac, lilac, and Siberian peashrub.

These soils are well suited to wildlife habitat. They are best suited to habitat for openland and rangeland wildlife. Rangeland wildlife, such as pronghorn antelope, can be encouraged by developing livestock watering facilities, properly managing livestock grazing, and reseeding range where needed.

The main limitation of these soils for homesites is slope. Special designs for buildings and roads are necessary to overcome this limitation. Access roads must be designed to minimize frost-heave damage, particularly in areas of the Truckton soil. They must also have adequate cut-slope grade and be provided with drains to control surface runoff and keep soil losses to a minimum. Capability subclass VIe.

100—Truckton-Bresser complex, eroded. These are nearly level to moderately sloping soils on uplands. Slope ranges from 1 to 9 percent but averages about 4 percent. Elevation ranges from 6,300 to 7,000 feet. The average annual precipitation is about 15 inches, the average annual air temperature is about 47 degrees F, and the average frost-free period is about 135 days. The Truckton soil makes up about 55 percent of the complex, the Bresser soil about 30 percent, and other soils about 15 percent.

Included with this soil in mapping are small areas of Blakeland loamy sand, 1 to 9 percent slopes, and Truckton loamy sand, 1 to 9 percent slopes.

The Truckton soil is deep and well drained. It formed in alluvium and residuum derived from arkosic sedimentary rock. Typically, the grayish brown sandy loam surface layer is very thin or has been entirely removed by erosion. The subsoil is brown sandy loam about 16 inches thick. The substratum is light yellowish brown coarse sandy loam to a depth of 60 inches or more.

Permeability of the Truckton soil is moderately rapid. Effective rooting depth is 60 inches or more. Available water capacity is moderate. Surface runoff is medium to

rapid, and the hazard of erosion is high. Gullies 1 foot to 3 feet deep are common.

The Bresser soil is deep and well drained. It formed in alluvium and residuum derived from arkosic sedimentary rock. Typically, the grayish brown sandy loam surface layer is very thin or has been entirely removed by erosion. The subsoil is brown sandy clay loam about 31 inches thick. The substratum is light yellowish brown loamy coarse sand to a depth of 60 inches or more.

Permeability of the Bresser soil is moderate. Effective rooting depth is 60 inches or more. Available water capacity is moderate. Surface runoff is medium to rapid, and the hazard of erosion is high. Gullies 1 foot to 3 feet deep are common.

These soils are commonly used for grazing livestock and for wildlife habitat. Most areas of these soils are fields that were previously cropped but have either been abandoned or reseeded to grass.

These soils are suited to deep-rooted grasses. Native vegetation is dominantly western wheatgrass, side-oats grama, and needleandthread.

Proper range management is needed to prevent excessive removal of the plant cover from these soils. Interseeding improves the existing vegetation. Deferment of grazing in spring increases plant vigor and soil stability. Properly locating livestock watering facilities helps to control grazing.

Windbreaks and environmental plantings generally are suited to these soils. Soil blowing is the main limitation for establishing trees and shrubs. This limitation can be overcome by cultivating only in the tree rows and leaving a strip of vegetation between the rows. Supplemental irrigation may be needed when planting and during dry periods. Trees that are best suited and have good survival are Rocky Mountain juniper, eastern redcedar, ponderosa pine, Siberian elm, Russian-olive, and hackberry. Shrubs that are best suited are skunkbush sumac, lilac, and Siberian peashrub.

These soils are suited to wildlife habitat. They are best suited to habitat for openland and rangeland wildlife. Rangeland wildlife, such as pronghorn antelope, can be encouraged by developing livestock watering facilities, properly managing livestock grazing, and reseeding range where needed.

The main limitation of these soils for homesites is frost-action potential, especially in areas of the Truckton soil. Special practices are needed to reduce the hazard of erosion in areas of construction where vegetation has been removed from the soils. Access roads must be designed to minimize frost-heave damage in areas of the Truckton soil. Capability subclass VIe.

101—Ustic Torrifluvents, loamy. These deep, well drained soils are on terraces and flood plains along the major drainageways. Some of the larger areas of these soils are in the Jimmy Creek Camp and Black Squirrel Creek drainageways and in the Ellicott area. Slope is 0 to 3 percent. The average annual precipitation is about 15 inches, the average annual air temperature is about 48 degrees F, and the average frost-free period is about 135 days.

Typically, the surface layer is grayish brown to very dark grayish brown gravelly sandy loam to clay loam 6 to 18 inches thick. The stratified underlying material, to a depth of 60 inches, ranges from heavy clay loam to sand.

Included with these soils in mapping are small areas of Blendon sandy loam, 0 to 3 percent slopes; Bresser sandy loam, 0 to 3 percent slopes; Nunn clay loam, 0 to 3 percent slopes; and Sampson loam, 0 to 3 percent slopes.

Permeability of Ustic Torrifluvents, loamy, is moderate. Effective rooting depth is 60 inches or more. Available water capacity is moderate to high. Surface runoff is slow, and the hazard of erosion is moderate to high. These soils are occasionally flooded. The hazard of soil blowing is moderate to high.

About half of the acreage of these soils is used for irrigated corn, bluegrass sod, and alfalfa and for dryfarmed wheat. The slow surface runoff reduces the need for intensive conservation measures. Most irrigated areas are in the Ellicott area and the Jimmy Camp Creek area. The rest of the acreage is used as rangeland.

These soils are suited to the production of native vegetation suitable for grazing. The soils favor tall grasses. The native vegetation is mainly big bluestem, switchgrass, junegrass, western wheatgrass, and blue grama.

To achieve needed grazing management, including periodic deferment, fences are generally arranged in such a way that access to these soils can be controlled. Reseeding on these soils is needed if the vegetation is depleted or destroyed by plowing. Water spreading is highly beneficial in suitable areas of these soils.

Windbreaks and environmental plantings generally are suited to these soils. Soil blowing is the main limitation for the establishment of trees and shrubs. This limitation can be overcome by cultivating only in the tree rows and leaving a strip of vegetation between the rows. Supplemental irrigation may be needed when planting and during dry periods. Trees that are best suited and have good survival are Rocky Mountain juniper, eastern redcedar, ponderosa pine, Siberian elm, Russian-olive, and hackberry. Shrubs that are best suited are skunkbush sumac, lilac, and Siberian peashrub.

These soils are suited to wildlife habitat. They are best suited to habitat for openland and rangeland wildlife. In cropland areas, habitat favorable for ring-necked pheasant, mourning dove, and many nongame species can be developed by establishing areas for nesting and escape cover. For pheasant, undisturbed nesting cover is vital and should be provided for in plans for habitat development. This is especially true in areas of intensive farming. Rangeland wildlife, such as pronghorn antelope, can be encouraged by developing livestock watering facilities, properly managing livestock grazing, and reseeding range where needed.

The main limitation of these soils for urban use is the hazard of flooding. Buildings and roads should not be

built along drainageways and on flood plains. Access roads must be designed to minimize frost-heave damage. Capability subclasses IIIe, nonirrigated, and IIe, irrigated.

102—Valent sand, 1 to 9 percent slopes. This deep, nearly level to gently rolling, excessively drained soil formed in sandy eolian material on uplands. Elevation ranges from 5,100 to 5,600 feet. The average annual precipitation is about 13 inches, the average annual air temperature is about 49 degrees F, and the average frost-free period is about 145 days.

Typically, the surface layer is light brownish gray sand about 6 inches thick. The next layer is brown sand about 6 inches thick. The substratum is pale brown sand to a depth of 60 inches or more.

Included with this soil in mapping are small areas of Bijou loamy sand, 1 to 8 percent slopes, and Wigton loamy sand, 1 to 8 percent slopes.

Permeability of this Valent soil is rapid. Effective rooting depth is 60 inches or more. Available water capacity is low to moderate. Surface runoff is slow, and the hazards of erosion and soil blowing are high.

This soil is used as rangeland and for wildlife habitat.

The native vegetation is mainly sand reedgrass, sand bluestem, blue grama, little bluestem, and needleandthread. Sand sagebrush is in the stand, but it makes up only a small part of the total ground cover. Large amounts of yucca are present in some places.

Mechanical and chemical control of sagebrush may be needed in overgrazed areas of this soil. The soil is highly susceptible to soil blowing, and water erosion occurs when the plant cover is inadequate. Interseeding is a good practice in overgrazed areas. Properly locating livestock watering facilities helps to control grazing.

Windbreaks and environmental plantings are fairly well suited to this soil. Blowing sand and low available water capacity are the main limitations for the establishment of trees and shrubs. The soil is so loose that trees need to be planted in shallow furrows and plant cover needs to be maintained between the rows. Supplemental irrigation may be needed to insure survival. Trees that are best suited and have good survival are Rocky Mountain juniper, eastern redcedar, ponderosa pine, and Siberian elm. Shrubs that are best suited are skunkbush sumac, lilac, and Siberian peashrub.

This soil is suited to wildlife habitat. It is best suited to habitat for openland and rangeland wildlife. Rangeland wildlife, such as pronghorn antelope, can be encouraged by developing livestock watering facilities, properly managing livestock grazing, and reseeding range where needed.

The main limitation of this soil for homesites is the sandy nature of the soil, which makes excavation difficult. Special erosion control practices are needed during construction. Because of the rapid permeability of this soil, there is a hazard of pollution if it is used for septic tank absorption fields. Capability subclass VIe.

103—Valent sand, 9 to 20 percent slopes. This deep, excessively drained, rolling to hilly soil formed in sandy eolian material on uplands. Elevation ranges from 5,100 to 5,600 feet. The average annual precipitation is about 13 inches, the average annual air temperature is about 49 degrees F, and the average frost-free period is about 145 days.

Typically, the surface layer is light brownish gray sand about 6 inches thick. The next layer is brown sand about 6 inches thick. The underlying material is pale brown sand to a depth of 60 inches or more.

Included with this soil in mapping are small areas of Bijou loamy sand, 1 to 8 percent slopes; Wigton loamy sand, 1 to 8 percent slopes; and Valent sand, 1 to 9 percent slopes.

Permeability of this Valent soil is rapid. Effective rooting depth is 60 inches or more. Available water capacity is low to moderate. Surface runoff is slow, and the hazard of erosion is high. Blowouts are common in all areas of this soil.

This soil is used as rangeland and for wildlife habitat.

The native vegetation is mainly prairie sandreed, sand bluestem, needleandthread, and sand dropseed.

Careful grazing management is essential on this soil to prevent overgrazing, because the hazard of soil blowing is high when the protective plant cover is destroyed. Livestock watering facilities should not be located on this soil, because they cause concentrations of animals that deplete the rangeland cover. No mechanical type of conservation treatment is practical on this soil.

Windbreaks and environmental plantings are fairly well suited to this soil. Blowing sand and low available water capacity are the main limitations for the establishment of trees and shrubs. The soil is so loose that trees need to be planted in shallow furrows and the plant cover should be maintained between the rows. Supplemental irrigation may be needed to insure survival. Trees that are best suited and have good survival are Rocky Mountain juniper, eastern redcedar, ponderosa pine, and Siberian elm. Shrubs that are best suited are skunkbush sumac, lilac, and Siberian peashrub.

This soil is suited to wildlife habitat. It is best suited to habitat for openland and rangeland wildlife. Rangeland wildlife, such as pronghorn antelope, can be encouraged by developing livestock watering facilities, properly managing livestock grazing, and reseeding range where needed.

The main limitations of this soil for urban use are slope and the sandy texture of the soil. Special designs are needed for buildings and roads to overcome these limitations. The sandy texture of the soil causes excavation problems, mostly the caving in of cut banks. Practices are needed to control soil blowing. Because of the rapid permeability of this soil, there is a hazard of pollution if it is used for septic tank absoption fields. Capability subclass VIe.

104—Vona sandy loam, 1 to 3 percent slopes. This deep, well drained soil formed in sandy, calcareous eolian

material on uplands. Elevation ranges from 5,200 to 6,000 feet. The average annual precipitation is about 13 inches, the average annual air temperature is about 49 degrees F, and the average frost-free period is about 145 days.

Typically, the surface layer is brown sandy loam about 7 inches thick. The subsoil is brown sandy loam about 8 inches thick. The substratum, to a depth of 60 inches, is pale brown sandy loam in the upper part and grades to light yellowish brown fine sandy loam in the lower part. Visible soft lime masses are in some parts of the substratum.

Included with this soil in mapping are small areas of Olney and Vona soils, eroded, and Olney sandy loam, 0 to 3 percent slopes. Also included are several wet-weather lakes, usually less than 2 acres in size.

Permeability of this Vona soil is moderately rapid. Effective rooting depth is 60 inches or more. Available water capacity is moderate. Surface runoff is slow, the hazard of erosion is moderate, and the hazard of soil blowing is high.

This soil is used for grazing livestock, nonirrigated cropland, and a few small areas of irrigated cropland. Sorghum, sudangrass, millet, and pinto beans are the main crops. Alfalfa and small grain are grown under irrigation.

This soil is extremely susceptible to blowing, and much of the acreage has been damaged by soil blowing. The soil should be protected by maintaining plant cover at all times. If crops are grown, the amount of residue produced is often insufficient to control erosion.

This soil is suited to the production of native vegetation suitable for grazing. The native vegetation is dominantly blue grama, sand dropseed, needleandthread, and sideoats grama.

Management of grazing is needed on this soil to maintain or improve range condition. Seeding is needed if the range has deteriorated. Seeding of native grasses is a good practice.

Windbreaks and environmental plantings are generally suited to this soil. Soil blowing is the main limitation for the establishment of trees and shrubs. This limitation can be overcome by cultivating only in the tree rows and leaving a strip of vegetation between the rows. Supplemental irrigation may be needed when planting and during dry periods. Trees that are best suited and have good survival are Rocky Mountain juniper, eastern redcedar, ponderosa pine, Siberian elm, Russian-olive, and hackberry. Shrubs that are best suited are skunkbush sumac, lilac, and Siberian peashrub.

This soil is suited to wildlife habitat. It is best suited to habitat for openland and rangeland wildlife. In cropland areas, habitat favorable for ring-necked pheasant, mourning dove, and many nongame species can be developed by establishing areas for nesting and escape cover. For pheasant, undisturbed nesting cover is vital and should be provided for in plans for habitat development. Rangeland wildlife, such as pronghorn antelope, can be encouraged by developing livestock watering facilities, properly managing livestock grazing, and reseeding range where needed.

This soil has good potential for homesites. The main limitations of this soil for roads and streets are limited ability to support a load and frost-action potential. Roads must be designed to overcome these limitations. The soil should be stabilized after site preparation, and as much of the existing vegetation should be left in place as possible. During site preparation, only small areas of this soil should be disturbed at a time. Capability subclasses IVe, nonirrigated and IIIe, irrigated.

105—Vona sandy loam, 3 to 9 percent slopes. This deep, well drained soil formed in sandy, calcareous eolian material on uplands. Elevation ranges from 5,200 to 6,000 feet. The average annual precipitation is about 13 inches, the average annual air temperature is about 49 degrees F, and the average frost-free period is about 145 days.

Typically, the surface layer is brown sandy loam about 7 inches thick. The subsoil is brown sandy loam about 8 inches thick. The substratum to a depth of 60 inches is pale brown sandy loam in the upper part and grades to light yellowish brown fine sandy loam in the lower part. Visible soft lime masses are in some parts of the substratum.

Included with this soil in mapping are small areas of Olney and Vona soils, eroded; Olney sandy loam, 3 to 5 percent slopes; and Valent sand, 1 to 9 percent slopes. Several wet-weather lakes are also included.

Permeability of this Vona soil is moderately rapid. Effective rooting depth is 60 inches or more. Available water capacity is moderate. Surface runoff is medium, the hazard of erosion is moderate to high, and the hazard of soil blowing is high.

Most of this soil is used as rangeland and for wildlife habitat.

This soil is suited to the production of native vegetation suitable for grazing. Native vegetation is dominantly blue grama, sand dropseed, needleandthread, and side-oats grama.

Management of grazing is needed on this soil to maintain or improve productive range condition. Seeding is needed if the range has deteriorated. Seeding of native grasses is a good practice.

Windbreaks and enviromental plantings are generally suited to this soil. Soil blowing is the main limitation for the establishment of trees and shrubs. This limitation can be overcome by cultivating only in the tree rows and leaving a strip of vegetation between the rows. Supplemental irrigation may be needed when planting and during dry periods. Trees that are best suited and have good survival are Rocky Mountain juniper, eastern redcedar, ponderosa pine, Siberian elm, Russian-olive, and hackberry. Shrubs that are best suited are skunkbush sumac, lilac, and Siberian peashrub.

This soil is suited to wildlife habitat. It is best suited to habitat for openland and rangeland wildlife. Rangeland wildlife, such as pronghorn antelope, can be encouraged by developing livestock watering facilities, properly

managing livestock grazing, and reseeding range where needed.

This soil has good potential for use as homesites. The main limitations of this soil for roads and streets are limited ability to support a load and frost action potential. Roads must be designed to overcome these limitations. This soil should be stabilized after site preparation, and as much of the existing vegetation as possible should be left on the soil. During site preparation, only small areas of this soil should be disturbed at a time. Capability subclass VIe.

106—Wigton loamy sand, 1 to 8 percent slopes. This deep, excessively drained soil formed in noncalcareous, sandy eolian material on dunelike uplands. Elevation ranges from 5,300 to 6,000 feet. The average annual precipitation is about 13 inches, the average annual air temperature is about 49 degrees F, and the average frost-free period is about 145 days.

Typically, the surface layer is brown loamy sand about 8 inches thick. The next layer is brown loamy sand about 11 inches thick. The underlying material is very pale brown sand to a depth of 60 inches or more.

Included with this soil in mapping are small areas of Bijou loamy sand, 1 to 8 percent slopes; Bijou sandy loam, 1 to 3 percent slopes; Bijou sandy loam, 3 to 8 percent slopes; and Valent sand, 1 to 9 percent slopes.

Permeability of this Wigton soil is rapid. Effective rooting depth is 60 inches or more. Available water capacity is low to moderate. Surface runoff is low, the hazard of erosion is moderate to high, and the hazard of soil blowing is high.

This soil is used mostly as rangeland.

If sprinkler irrigation is used, this soil is suited to limited use as cropland and pasture if crop residue is maintained on the surface. Only a very small acreage of this soil is cultivated, and it is used for alfalfa and grasses that are harvested for hay or are grazed by livestock. Nitrogen and phosphorus fertilizer is required for satisfactory yields. The soil is unsuited to nonirrigated crops.

Rangeland vegetation on this soil is mainly sand reedgrass, and bluestem, and needleandthread. Sand sagebrush is present in the stand, but it makes up only a small part of the total ground cover.

Mechanical and chemical methods of sagebrush control may be needed in overgrazed areas. This soil is highly susceptible to soil blowing, and it is subject to water erosion when the plant cover is inadequate. Interseeding is needed in overgrazed areas. Properly locating livestock watering facilities helps to control grazing.

Windbreaks and environmental plantings are fairly well suited to this soil. Blowing sand and low available water capacity are the main limitations for the establishment of trees and shrubs. The soil is so loose that trees need to be planted in shallow furrows and plant cover needs to be maintained between the rows. Supplemental irrigation may be needed to insure survival. Trees that are best suited and have good survival are Rocky Mountain juniper, eastern redcedar, ponderosa pine, and Siberian elm. Shrubs that are best suited are skunkbush sumac, lilac, and Siberian peashrub.

This soil is suited to wildlife habitat. It is best suited to habitat for openland and rangeland wildlife. Rangeland wildlife, such as pronghorn antelope, can be encouraged by developing livestock watering facilities, properly managing livestock grazing, and reseeding range where needed.

The main limitations of this soil for homesites are unstable cut banks during excavation and the hazard of soil blowing. Trenches for pipelines and shallow excavations must be made in such a way that cut banks remain stable, thus providing proper protection for workmen. Special practices must be used to control soil blowing. Only small areas of this soil should be disturbed at a time during construction in order to leave as much vegetation on the surface as possible. Capability subclasses VIe, nonirrigated, and IVe, irrigated.

107—Wiley silt loam, 1 to 3 percent slopes. This deep, well drained soil formed in calcareous, silty eolian material. Elevation ranges from 5,200 to 6,200 feet. The average annual precipitation is about 13 inches, the average annual air temperature is about 49 degrees F, and the average frost-free period is about 145 days.

Typically, the surface layer is pale brown silt loam about 5 inches thick. The subsoil is very pale brown heavy silt loam about 18 inches thick. The substratum is very pale brown silt loam to a depth of 60 inches or more. Visible soft masses of lime are in the lower part of the subsoil and in the substratum.

Included with this soil in mapping are small areas of Fort Collins loam, 0 to 3 percent slopes; Keith silt loam, 0 to 3 percent slopes; and Satanta loam, 0 to 3 percent slopes.

Permeability of this Wiley soil is moderate. Effective rooting depth is 60 inches or more. Available water capacity is high. Surface runoff is slow, the hazard of erosion is slight to moderate, and the hazard of soil blowing is high.

Most areas of this soil are used as rangeland, but a few small areas are dryfarmed.

This soil is well suited to the production of native vegetation suitable for grazing. The native vegetation is mainly blue grama, western wheatgrass, sand dropseed, and galleta.

Fencing and properly locating livestock watering facilities help to control grazing. Deferment of grazing may be necessary to maintain a needed balance between livestock use and forage production. In areas where the plant cover has been depleted, pitting can be used to help the native vegetation recover. Chemical control practices may be needed in disturbed areas where dense stands of pricklypear occur. Ample amounts of litter and forage should be left on the soil because of the high hazard of soil blowing.

Windbreaks and environmental plantings generally are well suited to this soil. Summer fallow a year prior to

planting and continued cultivation for weed control are needed to insure the establishment and survival of plantings. Trees that are best suited and have good survival are Rocky Mountain juniper, eastern redcedar, ponderosa pine, Siberian elm, Russian-olive, and hackberry. Shrubs that are best suited are skunkbush sumac, lilac, Siberian peashrub, and American plum.

This soil is best suited to habitat for openland wildlife, such as pheasant, mourning dove, and cottontail. Development of wildlife habitat, including tree, shrub, and grass plantings to serve as nesting areas, should be successful without irrigation during most years. Under irrigation, excellent wildlife habitat could be developed that would benefit many kinds of openland wildlife.

The main limitations of this soil for urban uses are potential frost action and limited ability to support a load. Dwellings or roads can be designed to offset these limitations. Capability subclass IVe.

108—Wiley silt loam, 3 to 9 percent slopes. This deep, well drained soil formed in calcareous, silty eolian material. Elevation ranges from 5,200 to 6,200 feet. The average annual precipitation is about 13 inches, the average annual air temperature is about 49 degrees F, and the average frost free period is about 145 days.

Typically, the surface layer is pale brown silt loam about 5 inches thick. The subsoil is very pale brown heavy silt loam about 18 inches thick. The substratum is very pale brown silt loam to a depth of 60 inches. Visible soft masses of lime are in the lower part of the subsoil and in the substratum.

Included with this soil in mapping are small areas of Fort Collins loam, 3 to 8 percent slopes; Stoneham sandy loam, 3 to 8 percent slopes; Keith silt loam, 0 to 3 percent slopes; and Satanta loam, 3 to 5 percent slopes.

Permeability of this Wiley soil is moderate. Effective rooting depth is 60 inches or more. Available water capacity is high. Surface runoff is medium, the hazard of erosion is moderate, and the hazard of soil blowing is high.

Almost all areas of this soil are used as rangeland and for wildlife habitat.

This soil is well suited to the production of native vegetation suitable for grazing. Native vegetation is mainly blue grama, western wheatgrass, sand dropseed, and galleta.

Fencing and properly locating livestock watering facilities help to control grazing. Deferment of grazing may be necessary to maintain a needed balance between livestock use and forage production. In areas where the plant cover has been depleted, pitting can be used to help the natural vegetation recover. Chemical control practices may be needed in disturbed areas where dense stands of pricklypear occur. Ample amounts of litter and forage should be left on the soil because of the high hazard of soil blowing.

Windbreaks and environmental plantings generally are well suited to this soil. Summer fallow a year prior to planting and continued cultivation for weed control are needed to insure the establishment and survival of plantings. Trees that are best suited and have good survival are Rocky Mountain juniper, eastern redcedar, ponderosa pine, Siberian elm, Russian-olive, and hackberry. Shrubs that are best suited are skunkbush sumac, lilac, Siberian peashrub, and American plum.

This soil is best suited to habitat for openland wildlife, such as pheasant, mourning dove, and cottontail. Wildlife habitat development, including tree and shrub plantings as well as grass plantings to serve as nesting areas, should be successful without irrigation during most years. If this soil is irrigated, excellent habitat that would benefit many kinds of openland wildlife could be established.

The main limitations of this soil for urban uses are potential frost action and limited ability to support a load. Dwellings and roads can be designed to offset these limitations. Access roads must have adequate cut-slope grade and be provided with drains to control surface runoff and thus keep soil losses to a minimum. Capability subclass VIe.

109—Yoder gravelly sandy loam, 1 to 8 percent slopes. This deep, well drained, gravelly soil formed in noncalcareous alluvium derived from arkosic deposits on uplands. Elevation ranges from 6,200 to 6,900 feet. The average annual precipitation is about 15 inches, the average annual air temperature is about 47 degrees F, and the average frost-free period is about 135 days.

Typically, the surface layer is grayish brown gravelly sandy loam about 6 inches thick. The subsoil is brown gravelly sandy clay loam about 6 inches thick. The substratum is very gravelly loamy coarse sand to a depth of 60 inches.

Included with this soil in mapping are small areas of Bresser sandy loam, 0 to 3 percent slopes; Bresser sandy loam, 3 to 5 percent slopes; Louviers silty clay loam, 3 to 18 percent slopes; and Truckton sandy loam, 3 to 9 percent slopes.

Permeability of this Yoder soil is moderately rapid. Effective rooting depth is 60 inches or more. Available water capacity is low to moderate. Surface runoff is slow to medium, and the hazard of erosion is slight.

Most areas of this soil are used for rangeland and wildlife habitat, but a few small areas where slopes are less than 3 percent are cultivated.

The native vegetation is mainly western wheatgrass, side-oats grama, needleandthread, and little bluestem. The most prominent shrub on this soil is true mountain-mahogany.

Properly locating livestock watering facilities helps to control grazing of livestock.

Windbreaks and environmental plantings are suited to this soil. Low available water capacity is the main limitation for the establishment of tree and shrub plantings. Summer fallow a year in advance and continued cultivation for weed control are needed to insure the establishment and survival of plantings. Supplemental irrigation may also be needed to insure survival. Trees that are best

suited and have good survival are Rocky Mountain juniper, eastern redcedar, ponderosa pine, and Siberian elm. Shrubs that are best suited are skunkbush sumac and lilac.

This soil is suited to wildlife habitat. It is best suited to habitat for openland and rangeland wildlife. Rangeland wildlife, such as pronghorn antelope, can be encouraged by developing livestock watering facilities, properly managing livestock grazing, and reseeding range where needed.

The main limitation of this soil for excavations is the high gravel content, which causes cut banks to cave in. Excavations for underground utilities need to be designed to overcome this limitation. Capability subclass VIe.

110—Yoder gravelly sandy loam, 8 to 25 percent slopes. This deep, well drained, gravelly soil formed in noncalcareous alluvium derived from arkosic deposits on uplands. Elevation ranges from 6,200 to 6,900 feet. The average annual precipitation is about 15 inches, the average annual air temperature is about 47 degrees F, and the average frost-free period is about 135 days.

Typically, the surface layer is grayish brown gravelly sandy loam about 6 inches thick. The subsoil is brown gravelly sandy clay loam about 6 inches thick. The substratum is very gravelly loamy coarse sand to a depth of 60 inches or more.

Included with this soil in mapping are small areas of Louviers silty clay loam, 3 to 18 percent slopes, and Truckton-Bresser complex, 5 to 20 percent slopes.

Permeability of this Yoder soil is moderately rapid. Effective rooting depth is 60 inches or more. Available water capacity is low to moderate. Surface runoff is medium to rapid, and the hazard of erosion is moderate. Some gullies have developed along drainageways, and there is some soil slippage on the steeper slopes.

This soil is used as rangeland and for wildlife habitat.

The native vegetation is mainly western wheatgrass, side-oats grama, needleandthread, and little bluestem. The most prominent shrub on this soil is true mountain-mahogany.

Vegetation is very difficult to reestablish on this soil if the native vegetation is destroyed. Properly locating livestock watering facilities helps to control grazing.

Windbreaks and environmental plantings are suited to this soil. Low available water capacity is the main limitation for the establishment of tree and shrub plantings. Summer fallow a year in advance and continued cultivation for weed control are needed to insure the establishment and survival of plantings. Supplemental irrigation may also be needed to insure survival. Trees that are best suited and have good survival are Rocky Mountain juniper, eastern redcedar, ponderosa pine, and Siberian elm. Shrubs that are best suited are skunkbush sumac and lilac.

This soil is suited to wildlife habitat. It is best suited to habitat for openland and rangeland wildlife. Rangeland wildlife, such as pronghorn antelope, can be encouraged by developing livestock watering facilities, properly managing livestock grazing, and reseeding range where needed.

The main limitation of this soil for homesites is slope. The high gravel content can cause some excavation problems, such as unstable cut banks. Special designs for buildings and roads are required to overcome this limitation. Access roads must have adequate cut-slope grade and be provided with drains to control surface runoff and keep soil losses to a minimum. Capability subclass VIe.

Use and management of the soils

The soil survey is a detailed inventory and evaluation of the most basic resource of the survey area—the soil. It is useful in adjusting land use, including urbanization, to the limitations and potentials of natural resources and the environment. Also, it can help avoid soil-related failures in uses of the land.

While a soil survey is in progress, soil scientists, conservationists, engineers, and others keep extensive notes about the nature of the soils and about unique aspects of behavior of the soils. These notes include data on erosion, drought damage to specific crops, yield estimates, flooding, the functioning of septic tank disposal systems, and other factors affecting the productivity, potential, and limitations of the soils under various uses and management. In this way, field experience and measured data on soil properties and performance are used as a basis for predicting soil behavior.

Information in this section is useful in planning use and management of soils for crops and pasture, rangeland, and woodland; as sites for buildings, highways and other transportation systems, sanitary facilities, and parks and other recreation facilities; and for wildlife habitat. From the data presented, the potential of each soil for specified land uses can be determined, soil limitations to these land uses can be identified, and costly failures in houses and other structures, caused by unfavorable soil properties, can be avoided. A site where soil properties are favorable can be selected, or practices that will overcome the soil limitations can be planned.

Planners and others using the soil survey can evaluate the impact of specific land uses on the overall productivity of the survey area or other broad planning area and on the environment. Productivity and the environment are closely related to the nature of the soil. Plans should maintain or create a land-use pattern in harmony with the natural soil.

Contractors can find information that is useful in locating sources of sand and gravel, roadfill, and topsoil. Other information indicates the presence of bedrock, wetness, or very firm soil horizons that cause difficulty in excavation.

Health officials, highway officials, engineers, and many other specialists also can find useful information in this soil survey. The safe disposal of wastes, for example, is closely related to properties of the soil. Pavements, sidewalks, campsites, playgrounds, lawns, and trees and shrubs are influenced by the nature of the soil.

Crops and pasture

By Donald E. Nielsen, district conservationist, Soil Conservation Service.

The major management concerns in the use of the soils for crops and pasture are described in this section. In addition, the crops or pasture plants best suited to the soil, including some not commonly grown in the survey area, are discussed; the system of land capability classification used by the Soil Conservation Service is explained; and the estimated yields of the main crops and hay and pasture plants are presented for each soil.

This section provides information about the overall agricultural potential of the survey area and about the needed management practices. The information is useful to equipment dealers, land improvement contractors, fertilizer companies, processing companies, planners, conservationists, and others. For each kind of soil, information about management is presented in the section "Soil maps for detailed planning." Planners of management systems for individual fields or farms should also consider the detailed information given in the description of each soil.

Approximately 136,000 acres in the survey area is used for crops and pasture. Pasture is defined as introduced grasses and legumes used for grazing. Range consisting primarily of native grasses is not included in this acreage. Approximately 15,000 acres is irrigated. Of the total acreage, 63,000 acres is used for permanent pasture and hayland; 17,000 acres for row crops, mainly corn and sorghum; 35,000 acres for close-grown crops, mainly wheat, sudangrass, and millet; and 6,000 acres for rotation hay and pasture, mainly alfalfa.

The potential productivity of the nonirrigated soils in the El Paso County Area is limited by low average annual precipitation, which ranges from 11 to 19 inches. Cool temperatures and a short growing season further limit the choice of crops on soils in the 16- to 19-inch precipitation zone.

On nonirrigated land the main crops are wheat, sorghum, sudangrass, and millet. There is also a significant acreage of pinto beans grown in the southeastern part of the survey area. Soil blowing is the major concern, especially in the drier southeastern part of the survey area. Water erosion is a major concern on cropland in the northern half of the survey area and, to a lesser extent, in the southern half.

Soil loss through erosion is damaging for three reasons. First, soil productivity is reduced as the surface layer with its organic matter is lost and part of the subsoil is incorporated into the plow layer. Second, loss of the subsoil reduces available water capacity. Continued loss of the clay fraction from the subsoil reduces the clod-forming ability of soils and makes them increasingly more susceptible to erosion. Third, soil erosion results in damage to crops and land by deposition or sedimentation and may be a hazard to the health of the biological population of the area, including man.

Measures for minimizing soil erosion include cropping only those soils best suited to cultivation, growing high residue- producing crops, keeping crop residue intact on the surface through management of tillage and grazing after harvest, and maintaining surface roughness through proper tillage during periods when crop residue is inadequate.

Application of nitrogen fertilizer is necessary on the sandy soils if they are used for continuous production of such residue- producing crops as sorghums, sudangrass, or millet.

Terraces reduce length of slope and reduce runoff and erosion. They are practical on the deep soils that have regular slopes. Most of the terraces in the Area have been constructed on slopes of 2 to 4 percent in the northeastern part of the survey area, where the average annual precipitation is more than 14 inches. Terrace systems must be properly designed, and their use must be supported by contour farming and crop residue management. Information on the selection of cropping systems and erosion control practices for each kind of soil is available at the local office of the Soil Conservation Service.

Smooth bromegrass, intermediate wheatgrass, pubescent wheatgrass, and crested wheatgrass are the main plants used for nonirrigated pasture. They are suited to a wide range of soils but are not suited to the drier soils in the survey area. Grazing management to maintain high forage production is the most important conservation practice for this land use.

The 15,000 acres of irrigated cropland and pasture is mainly in the Fountain Creek valley, where surface water rights are established, or in the Black Squirrel Creek basin, where wells drilled into the alluvium are the source of water. There is no appreciable potential for increasing the amount of irrigation water available, because all known water sources are fully developed. Acreage of irrigated soils in the Fountain Creek valley has been decreasing because more and more land is being used for residential, industrial, and commercial development. The main irrigated crops are alfalfa, corn, and grass or grass-legume mixtures for pasture. Sugar beets, dry beans, oats, barley, wheat, and potatoes are also suited to most of the irrigated soils. Apples and truck crops are minor crops. They have been successfully grown under irrigation on the Keith soils.

On the irrigated soils the most important concern is the management of irrigation water. In the Black Squirrel Creek basin, most of the irrigated soils are sandy loams or loamy sands, all of which have a high rate of water infiltration. Sprinkler irrigation is the prevalent method of water application. This method results in satisfactory irrigation efficiency when the timing and rate of application are properly adjusted to the needs of crops and the kinds of soil.

Surface irrigation is prevalent in the Fountain Creek valley. The quality of the soils and water is variable. Methods of surface application and length of run vary ac-

cording to crop, soil, and slope. Guidance in managing irrigation water and developing irrigation systems can be obtained from the local office of the Soil Conservation Service and the Cooperative Extension Service.

All crops on irrigated soils respond to fertilizer. The sandy loams and loamy sands under sprinkler irrigation require timely and fairly heavy applications of nitrogen for all crops except alfalfa.

Under good management, adequate crop residue can be used or cover crops can be maintained to effectively control soil blowing on even the sandy irrigated soils.

All irrigated cropping systems should include a deep rooted crop such as alfalfa for improvement of soil tilth, addition of organic matter and nitrogen to the soil, and full use of the fertilizer and water that were applied and stored in the soil when previous crops were grown.

Yields per acre

The average yields per acre that can be expected of the principal crops under a high level of management are shown in table 5. In any given year, yields may be higher or lower than those indicated in the table because of variations in rainfall and other climatic factors. Absence of an estimated yield indicates that the crop is not suited to or not commonly grown on the soil or that a given crop is not commonly irrigated.

The estimated yields were based mainly on the experience and records of farmers, conservationists, and extension agents. Results of field trials and demonstrations and available yield data from nearby counties were also considered.

The yields were estimated assuming that the latest soil and crop management practices were used. Hay and pasture yields were estimated for the most productive varieties of grasses and legumes suited to the climate and the soil. A few farmers may be obtaining average yields higher than those shown in table 5.

The management needed to achieve the indicated yields of the various crops depends on the kind of soil and the crop. Such management provides drainage, erosion control, and protection from flooding; the proper planting and seeding rates; suitable high-yielding crop varieties; appropriate tillage practices, including time of tillage and seedbed preparation and tilling when soil moisture is favorable; control of weeds, plant diseases, and harmful insects; favorable soil reaction and optimum levels of nitrogen, phosphorus, potassium, and trace elements for each crop; effective use of crop residues, barnyard manure, and green-manure crops; harvesting crops with the smallest possible loss; and timeliness of all fieldwork.

For yields of irrigated crops, it is assumed that the irrigation system is adapted to the soils and to the crops grown; that good quality irrigation water is uniformly applied in proper amounts as needed; and that tillage is kept to a minimum.

Crops other than those shown in table 5 are grown in the survey area, but estimated yields are not included because the acreage of these crops is small. The local offices of the Soil Conservation Service and the Cooperative Extension Service can provide information about the management concerns and productivity of the soils for these crops.

Capability classes and subclasses

Capability classes and subclasses show, in a general way, the suitability of soils for most kinds of field crops. The soils are classed according to their limitations when they are used for field crops, the risk of damage when they are used, and the way they respond to treatment. The grouping does not take into account major and generally expensive landforming that would change slope, depth, or other characteristics of the soils; does not take into consideration possible but unlikely major reclamation projects; and does not apply to rice, cranberries, horticultural crops, or other crops that require special management. Capability classification is not a substitute for interpretations designed to show suitability and limitations of groups of soils for rangeland, for forest trees, or for engineering purposes.

In the capability system, all kinds of soil are grouped at three levels: capability class, subclass, and unit. These levels are defined in the following paragraphs. A survey area may not have soils of all classes.

Capability classes, the broadest groups, are designated by Roman numerals I through VIII. The numerals indicate progressively greater limitations and narrower choices for practical use. The classes are defined as follows:

Class I soils have few limitations that restrict their use.

Class II soils have moderate limitations that reduce the choice of plants or that require moderate conservation practices.

Class III soils have severe limitations that reduce the choice of plants, or that require special conservation practices, or both.

Class IV soils have very severe limitations that reduce the choice of plants, or that require very careful management, or both.

Class V soils are not likely to erode but have other limitations, impractical to remove, that limit their use.

Class VI soils have severe limitations that make them generally unsuitable for cultivation.

Class VII soils have very severe limitations that make them unsuitable for cultivation.

Class VIII soils and landforms have limitations that nearly preclude their use for commercial crop production.

Capability subclasses are soil groups within one class; they are designated by adding a small letter, *e*, *w*, *s*, or *c*, to the class numeral, for example, IIe. The letter *e* shows that the main limitation is risk of erosion unless close-growing plant cover is maintained; *w* shows that water in or on the soil interferes with plant growth or cultivation (in some soils the wetness can be partly corrected by artificial drainage); *s* shows that the soil is limited mainly because it is shallow, droughty, or stony; and *c*, used in

only some parts of the United States, shows that the chief limitation is climate that is too cold or too dry.

In class I there are no subclasses because the soils of this class have few limitations. Class V contains only the subclasses indicated by *w*, *s*, or *c* because the soils in class V are subject to little or no erosion, though they have other limitations that restrict their use to pasture, rangeland, woodland, wildlife habitat, or recreation.

The capability subclass is identified in the description of each soil map unit in the section "Soil maps for detailed planning."

Rangeland

BY EDWARD C. DENNIS, range conservationist, and Charles Holcomb, soil conservationist, Soil Conservation Service.

About 66 percent of El Paso County Area is range. More than 80 percent of the farm income is derived from livestock, principally cattle. Cow-calf-steer operations are dominant in the eastern two-thirds of the county. The average operating unit has 1,520 acres of range and 400 acres of crop.

The forage produced on some of the ranches in the southeastern and central parts of the Area is supplemented by small grain crop stubble and alfalfa and bundle feed. In winter the native forage is supplemented with protein concentrate. A few ranchers practice creep feeding of calves and yearlings to increase market weight.

The native vegetation in most of the area has been greatly depleted by continued excessive use. Much of the area once covered with mountain muhly and big bluestem is now covered with blue grama and hairy goldaster. Sandy soils that once supported deep rooted grasses are now covered with sand sagebrush and tall rabbitbrush. Areas that once were predominantly in western wheatgrass and alkali sacaton are now in blue grama, galletagrass, and undesirable perennial vegetation.

The amount of forage produced in the survey area is about half of that originally produced. Productivity of the range can be increased by using management practices that are effective for specific kinds of soil and range sites.

The soils in El Paso County Area range from those on high mountains and foothills to those on semidesert shortgrass plains. The soils on mountains are along the western and northern boundaries of the county. The soils on foothills extend from the southwestern boundary northward to Colorado Springs and eastward to the county line. The soils on the semidesert plains are mostly east of Fountain Creek and south of an east-west line extending from Colorado Springs.

The soils on mountains are generally steep gravelly loams that are very erodible when the vegetation is destroyed. These soils support bunchgrasses that in plant succession eventually are replaced by trees and shrubs. The Black Forest area is somewhat different in that the slopes are not so steep and the soils range from clay loams to gravelly loamy sands. The bunchgrasses generally are dominant on the clay loams, and trees are dominant on the shallow gravelly soils.

The soils on foothills range from loamy sand to clay loam in texture, and each produces a particular kind of vegetation. The kind of vegetation depends on the kind of soil, but it ranges from bunchgrasses in association with low trees and shrubs to short grasses and midgrasses.

Short grasses generally are on the loamy soils of the plains, and tall deep-rooted grasses are dominant on the deep sandy soils. Midgrasses are dominant on the saline soils and on the clay loams. Water erosion and soil blowing are severe hazards on all the soils in the plain and foothill areas. On the sandy loams and loamy sands, wind produces blowouts, hummocks, and dunes when the vegetation is removed.

The major management concern on all of the rangeland in the Area is the control of grazing so that the kinds and amounts of plants that make up the potential plant community are re-established and maintained. Minimizing soil blowing is also an important management concern. If sound range management based on soil survey information and rangeland inventories is applied, the potential is good for increasing the productivity of the range in the Area.

Where climate and topography are about the same, differences in the kind and amount of vegetation that rangeland can produce are related closely to the kind of soil. Effective management is based on the relationships among soils, vegetation, and water.

Table 6 shows, for each kind of soil, the name of the range site; the total annual production of vegetation in favorable, normal, and unfavorable years; and the characteristic vegetation. The following are explanations of column headings in table 6.

A *range site* is a distinctive kind of rangeland that differs from other kinds of rangeland in its ability to produce a characteristic natural plant community. Soils that produce a similar kind, amount, and proportion of range plants are grouped into range sites. For those areas where the relationship between soils and vegetation has been established, range sites can be interpreted directly from the soil map. Properties that determine the capacity of the soil to supply moisture and plant nutrients have the greatest influence on the productivity of range plants. Soil reaction, salt content, and a seasonal high water table are also important.

Potential production refers to the amount of vegetation that can be expected to grow annually on well-managed rangeland that is supporting the potential natural plant community. It is expressed in pounds per acre of air-dry vegetation for favorable, normal, and unfavorable years. In a favorable year the amount and distribution of precipitation and the temperatures are such that growing conditions are substantially better than average; in a normal year these conditions are about average for the area; in an unfavorable year, growing conditons are well below average, generally because of low available soil moisture.

Dry weight refers to the total air-dry vegetation produced per acre each year by the potential plant community. Vegetation that is highly palatable to livestock and vegetation that is unpalatable are included. Some of the vegetation can also be grazed extensively by wildlife.

Characteristic species of grasses, grasslike plants, forbs, and shrubs that make up most of the potential natural plant community on each soil are listed by common name. Under *Composition*, the expected proportion of each species is presented as the percentage, in air-dry weight, of the total annual production of herbaceous and woody plants. Because only major species are listed, percentages do not necessarily total 100. The amount that can be used as forage depends on the kinds of grazing animals and on the grazing season. Generally all of the vegetation produced is not used.

Range management requires, in addition to knowledge of the kind of soil and the potential plant community, an evaluation of the present condition of the range vegetation in relation to its potential. Range condition is determined by comparing the present plant community with the potential natural plant community on a particular range site. The more closely the existing community resembles the potential community, the better the range condition. The objective in range management is to control grazing so that the plants growing on a site are about the same in kind and amount as the potential natural plant community for that site. Such management generally results in the maximum production of vegetation, conservation of water, and control of erosion. Sometimes, however, a range condition somewhat below the potential meets grazing needs, provides wildlife habitat, and protects soil and water resources.

Woodland management and productivity

By Thomas W. Ostermann, district forester, Colorado State Forest Service, and Sherman Finch, woodland conservationist, Soil Conservation Service.

About 6 percent of the survey area is in woodland. The major forest type in the survey area is ponderosa pine, which occurs mainly in the Black Forest area and along the foothills. Douglas-fir and pinyon-juniper forest types are also present, but in lesser amounts.

Harvesting of timber in the Area began in 1856, and extensive logging began about 1860. The lumber from the forests was used in nearby towns and for railroad ties. The forests still provide wood crops as well as other benefits, but they must be carefully managed.

Table 7 contains information useful to woodland owners or forest managers planning the use of the soils for wood crops. Map unit symbols for soils suitable for wood crops are listed, and the ordination (woodland suitability) symbol for each soil is given. All soils bearing the same ordination symbol require the same general kinds of woodland management and have about the same potential productivity.

The first part of the *ordination symbol*, a number, indicates the potential productivity of the soils for important trees. The number 1 indicates very high productivity; 2, high; 3, moderately high; 4, moderate; 5, low; and 6, very low. The second part of the symbol, a letter, indicates the major kind of soil limitation. The letter *x* indicates stoniness or rockiness; *w*, excessive water in or on the soil; *t*, toxic substances in the soil; *d*, restricted rooting depth; *c*, clay in the upper part of the soil; *s*, sandy texture; *f*, high content of coarse fragments in the soil profile; and *r*, steep slopes. The letter *o* indicates insignificant limitations or restrictions. If a soil has more than one limitation, priority in placing the soil into a limitation class is in the following order: x, w, t, d, c, s, f, and r.

In table 7 the soils are also rated for a number of factors to be considered in management. *Slight*, *moderate*, and *severe* are used to indicate the degree of major soil limitations.

Ratings of the *erosion hazard* indicate the risk of loss of soil in well-managed woodland. The risk is *slight* if the expected soil loss is small, *moderate* if some measures are needed to control erosion during logging and road construction, and *severe* if intensive management or special equipment and methods are needed to prevent excessive loss of soil.

Ratings of *equipment limitation* reflect the characteristics and conditions of the soil that restrict use of the equipment generally needed in woodland management or harvesting. A rating of *slight* indicates that use of equipment is not limited to a particular kind of equipment or time of year; *moderate* indicates a short seasonal limitation or a need for some modification in management or equipment; *severe* indicates a seasonal limitation, a need for special equipment or management, or a hazard in the use of equipment.

Seedling mortality ratings indicate the degree that the soil affects expected mortality of planted tree seedlings when plant competition is not a limiting factor. Seedlings from good planting stock that are properly planted during a period of sufficient rainfall are rated. A rating of *slight* indicates that the expected mortality of the planted seedlings is less than 25 percent; *moderate*, 25 to 50 percent; and *severe*, more than 50 percent.

Ratings of *plant competition* indicate the degree to which undesirable plants are expected to invade or grow if openings are made in the tree canopy. The invading plants compete with native plants or planted seedlings by impeding or preventing their growth. A rating of *slight* indicates little or no competition from other plants.

The *potential productivity* of merchantable or *important trees* on a soil is expressed as a *site index*. This index is the average height, in feet, that dominant and codominant trees of a given species attain in a specified number of years. The site index applies to fully stocked, even-aged, unmanaged stands. Important trees are those that woodland managers generally favor in intermediate or improvement cuttings. They are selected on the basis of growth rate, quality, value, and marketability.

Trees to plant are those that are suitable for commercial wood production and that are suited to the soils.

Windbreaks and environmental plantings

Windbreaks are established to protect livestock, buildings, and yards from wind and snow. Windbreaks also help to protect fruit trees and gardens, and they furnish habitat for wildlife. Several rows of both broadleaved and coniferous species provide the most protection.

Field windbreaks are narrow plantings made at right angles to the prevailing wind and at specific intervals across the field, the interval depending on the erodibility of the soil. They protect cropland and crops from wind and hold snow on the fields, and they also provide food and cover for wildlife.

Environmental plantings help to beautify and screen homes and other buildings and to abate noise around them. The plants, mostly evergreen shrubs and trees, are closely spaced. Healthy planting stock of suitable species planted properly on a well prepared site and maintained in good condition can insure a high degree of plant survival.

Windbreaks and environmental plantings in El Paso County Area require special care. Adequate site preparation and supplemental irrigation are necessary to insure establishment, and continued cultivation is necessary to reduce moisture stress to the plantings.

Additional information about planning windbreaks and screens and the planting and care of trees can be obtained from the local office of the Colorado State Forest Service, Soil Conservation Service, the Extension Service, or local nurserymen.

Engineering

This section provides information about the use of soils for building sites, sanitary facilities, construction material, and water management. Among those who can benefit from this information are engineers, landowners, community planners, town and city managers, land developers, builders, contractors, and farmers and ranchers.

The ratings in the engineering tables are based on test data and estimated data in the "Soil properties" section. The ratings were determined jointly by soil scientists and engineers of the Soil Conservation Service using known relationships between the soil properties and the behavior of soils in various engineering uses.

Among the soil properties and site conditions identified by a soil survey and used in determining the ratings in this section were grain-size distribution, liquid limit, plasticity index, soil reaction, depth to bedrock, hardness of bedrock that is within 5 or 6 feet of the surface, soil wetness, depth to a seasonal high water table, slope, likelihood of flooding, natural soil structure or aggregation, in-place soil density, and geologic origin of the soil material. Where pertinent, data about kinds of clay minerals, mineralogy of the sand and silt fractions, and the kind of absorbed cations were also considered.

On the basis of information assembled about soil properties, ranges of values can be estimated for erodibility, permeability, corrosivity, shrink-swell potential, available water capacity, shear strength, compressibility, slope stability, and other factors of expected soil behavior in engineering uses. As appropriate, these values can be applied to each major horizon of each soil or to the entire profile.

These factors of soil behavior affect construction and maintenance of roads, airport runways, pipelines, foundations for small buildings, ponds and small dams, irrigation projects, drainage systems, sewage and refuse disposal systems, and other engineering works. The ranges of values can be used to (1) select potential residential, commercial, industrial, and recreational uses; (2) make preliminary estimates pertinent to construction in a particular area; (3) evaluate alternative routes for roads, streets, highways, pipelines, and underground cables; (4) evaluate alternative sites for location of sanitary landfills, onsite sewage disposal systems, and other waste disposal facilities; (5) plan detailed onsite investigations of soils and geology; (6) find sources of gravel, sand, clay, and topsoil; (7) plan farm drainage systems, irrigation systems, ponds, terraces, and other structures for soil and water conservation; (8) relate performance of structures already built to the properties of the kinds of soil on which they are built so that performance of similar structures on the same or a similar soil in other locations can be predicted; and (9) predict the trafficability of soils for cross-country movement of vehicles and construction equipment.

Data presented in this section are useful for land-use planning and for choosing alternative practices or general designs that will overcome unfavorable soil properties and minimize soil-related failures. Limitations to the use of these data, however, should be well understood. First, the data are generally not presented for soil material below a depth of 5 or 6 feet. Also, because of the scale of the detailed map in this soil survey, small areas of soils that differ from the dominant soil may be included in mapping. Thus, these data do not eliminate the need for onsite investigations, testing, and analysis by personnel having expertise in the specific use contemplated.

The information is presented mainly in tables. Table 8 shows, for each kind of soil, the degree and kind of limitations for building site development; table 9, for sanitary facilities; and table 11, for water management. Table 10 shows the suitability of each kind of soil as a source of construction materials.

The information in the tables, along with the soil map, the soil descriptions, and other data provided in this survey, can be used to make additional interpretations and to construct interpretive maps for specific uses of land.

Some of the terms used in this soil survey have a special meaning in soil science. Many of these terms are defined in the Glossary.

Building site development

The degree and kind of soil limitations that affect shallow excavations, dwellings with and without basements, small commercial buildings, and local roads and streets are indicated in table 8. A *slight* limitation indicates that soil properties generally are favorable for the specified use; any limitation is minor and easily overcome. A *moderate* limitation indicates that soil properties and site features are unfavorable for the specified use, but the limitations can be overcome or minimized by special planning and design. A *severe* limitation indicates that one or more soil properties or site features are so unfavorable or difficult to overcome that a major increase in construction effort, special design, or intensive maintenance is required. For some soils rated severe, such costly measures may not be feasible.

Shallow excavations are made for pipelines, sewerlines, communication and power transmission lines, basements, open ditches, and cemeteries. Such digging or trenching is influenced by soil wetness caused by a seasonal high water table; the texture and consistence of soils; the tendency of soils to cave in or slough; and the presence of very firm, dense soil layers, bedrock, or large stones. In addition, excavations are affected by slope of the soil and the probability of flooding. Ratings do not apply to soil horizons below a depth of 6 feet unless otherwise noted.

In the soil series descriptions, the consistence of each soil horizon is given and the presence of very firm or extremely firm horizons, usually difficult to excavate, is indicated.

Dwellings and *small commercial buildings* referred to in table 8 are built on undisturbed soil and have foundation loads of a dwelling no more than three stories high. Separate ratings are made for small commercial buildings without basements and for dwellings with and without basements. For such structures, soils should be sufficiently stable that cracking or subsidence of the structure from settling or shear failure of the foundation does not occur. These ratings were determined from estimates of the shear strength, compressibility, and shrink-swell potential of the soil. Soil texture, plasticity and in-place density, potential frost action, soil wetness, and depth to a seasonal high water table were also considered. Soil wetness and depth to a seasonal high water table indicate potential difficulty in providing adequate drainage for basements, lawns, and gardens. Depth to bedrock, slope, and large stones in or on the soil are also important considerations in the choice of sites for these structures and were considered in determining the ratings. Susceptibility to flooding is a serious hazard.

Local roads and streets referred to in table 8 have an all-weather surface that can carry light to medium traffic all year. They consist of a subgrade of the underlying soil material; a base of gravel, crushed rock fragments, or soil material stabilized with lime or cement; and a flexible or rigid surface, commonly asphalt or concrete. The roads are graded with soil material at hand, and most cuts and fills are less than 6 feet deep.

The load supporting capacity and the stability of the soil as well as the quantity and workability of fill material available are important in design and construction of roads and streets. The classifications of the soil and the soil texture, density, shrink-swell potential, and potential frost action are indicators of the traffic supporting capacity used in making the ratings. Soil wetness, flooding, slope, depth to hard rock or very compact layers, and content of large stones affect stability and ease of excavation.

Sanitary facilities

Favorable soil properties and site features are needed for proper functioning of septic tank absorption fields, sewage lagoons, and sanitary landfills. The nature of the soil is important in selecting sites for these facilities and in identifying limiting soil properties and site features to be considered in design and installation. Also, those soil properties that affect ease of excavation or installation of these facilities will be of interest to contractors and local officials. Table 9 shows the degree and kind of limitations of each soil for such uses and for use of the soil as daily cover for landfills. It is important to observe local ordinances and regulations.

If the degree of soil limitation is expressed as *slight*, soils are generally favorable for the specified use and limitations are minor and easily overcome; if *moderate*, soil properties or site features are unfavorable for the specified use, but limitations can be overcome by special planning and design; and if *severe*, soil properties or site features are so unfavorable or difficult to overcome that major soil reclamation, special designs, or intensive maintenance is required. Soil suitability as daily cover for landfill is rated by the terms *good*, *fair*, or *poor*, which, respectively, mean about the same as the terms *slight*, *moderate*, and *severe*.

Septic tank absorption fields are subsurface systems of tile or perforated pipe that distribute effluent from a septic tank into the natural soil. Only the soil horizons between depths of 18 and 72 inches are evaluated for this use. The soil properties and site features considered are those that affect the absorption of the effluent and those that affect the construction of the system.

Properties and features that affect absorption of the effluent are permeability, depth to seasonal high water table, depth to bedrock, and susceptibility to flooding. Stones, boulders, and shallowness to bedrock interfere with installation. Excessive slope can cause lateral seepage and surfacing of the effluent. Also, soil erosion and soil slippage are hazards if absorption fields are installed on sloping soils.

In some soils, loose sand and gravel or fractured bedrock is less than 4 feet below the tile lines. In these soils the absorption field does not adequately filter the effluent, and ground water in the area may be contaminated.

On many of the soils that have moderate or severe limitations for use as septic tank absorption fields, a system to lower the seasonal water table can be installed or the size of the absorption field can be increased so that performance is satisfactory.

Sewage lagoons are shallow ponds constructed to hold sewage while aerobic bacteria decompose the solid and liquid wastes. Lagoons have a nearly level floor and cut slopes or embankments of compacted soil material. Aerobic lagoons generally are designed to hold sewage within a depth of 2 to 5 feet. Nearly impervious soil material for the lagoon floor and sides is required to minimize seepage and contamination of ground water. Soils that are very high in content of organic matter and those that have cobbles, stones, or boulders are not suitable. Unless the soil has very slow permeability, contamination of ground water is a hazard where the seasonal high water table is above the level of the lagoon floor. In soils where the water table is seasonally high, seepage of ground water into the lagoon can seriously reduce the lagoon's capacity for liquid waste. Slope, depth to bedrock, and susceptibility to flooding also affect the suitability of sites for sewage lagoons or the cost of construction. Shear strength and permeability of compacted soil material affect the performance of embankments.

Sanitary landfill is a method of disposing of solid waste by placing refuse in successive layers either in excavated trenches or on the surface of the soil. The waste is spread, compacted, and covered daily with a thin layer of soil material. Landfill areas are subject to heavy vehicular traffic. Risk of polluting ground water and trafficability affect the suitability of a soil for this use. The best soils have a loamy or silty texture, have moderate to slow permeability, are deep to a seasonal water table, and are not subject to flooding. Clayey soils are likely to be sticky and difficult to spread. Sandy or gravelly soils generally have rapid permeability, which might allow noxious liquids to contaminate ground water. Soil wetness can be a limitation, because operating heavy equipment on a wet soil is difficult. Seepage into the refuse increases the risk of pollution of ground water.

Ease of excavation affects the suitability of a soil for the trench type of landfill. A suitable soil is deep to bedrock and free of large stones and boulders. If the seasonal water table is high, water will seep into trenches.

Unless otherwise stated, the limitations in table 9 apply only to the soil material within a depth of about 6 feet. If the trench is deeper, a limitation of slight or moderate may not be valid. Site investigation is needed before a site is selected.

Daily cover for landfill should be soil that is easy to excavate and spread over the compacted fill in wet and dry periods. Soils that are loamy or silty and free of stones or boulders are better than other soils. Clayey soils may be sticky and difficult to spread; sandy soils may be subject to soil blowing.

The soils selected for final cover of landfills should be suitable for growing plants. Of all the horizons, the A horizon in most soils has the best workability, more organic matter, and the best potential for growing plants. Thus, for either the area- or trench-type landfill, stockpiling material from the A horizon for use as the surface layer of the final cover is desirable.

Where it is necessary to bring in soil material for daily or final cover, thickness of suitable soil material available and depth to a seasonal high water table in soils surrounding the sites should be evaluated. Other factors to be evaluated are those that affect reclamation of the borrow areas. These factors include slope, erodibility, and potential for plant growth.

Construction materials

The suitability of each soil as a source of roadfill, sand, gravel, and topsoil is indicated in table 10 by ratings of good, fair, or poor. The texture, thickness, and organic-matter content of each soil horizon are important factors in rating soils for use as construction materials. Each soil is evaluated to the depth observed, generally about 6 feet.

Roadfill is soil material used in embankments for roads. Soils are evaluated as a source of roadfill for low embankments, which generally are less than 6 feet high and less exacting in design than high embankments. The ratings reflect the ease of excavating and working the material and the expected performance of the material where it has been compacted and adequately drained. The performance of soil after it is stabilized with lime or cement is not considered in the ratings, but information about some of the soil properties that influence such performance is given in the descriptions of the soil series.

The ratings apply to the soil material between the A horizon and a depth of 5 to 6 feet. It is assumed that soil horizons will be mixed during excavation and spreading. Many soils have horizons of contrasting suitability within their profile. The estimated engineering properties in table 14 provide specific information about the nature of each horizon. This information can help determine the suitability of each horizon for roadfill.

Soils rated *good* are coarse grained. They have low shrink-swell potential, low potential frost action, and few cobbles and stones. They are at least moderately well drained and have slopes of 15 percent or less. Soils rated *fair* have a plasticity index of less than 15 and have other limiting features, such as moderate shrink-swell potential, moderately steep slopes, wetness, or many stones. If the thickness of suitable material is less than 3 feet, the entire soil is rated *poor*.

Sand and *gravel* are used in great quantities in many kinds of construction. The ratings in table 10 provide guidance as to where to look for probable sources and are based on the probability that soils in a given area contain sizable quantities of sand or gravel. A soil rated *good* or *fair* has a layer of suitable material at least 3 feet thick, the top of which is within a depth of 6 feet. Coarse frag-

ments of soft bedrock material, such as shale and siltstone, are not considered to be sand and gravel. Fine-grained soils are not suitable sources of sand and gravel.

The ratings do not take into account depth to the water table or other factors that affect excavation of the material. Descriptions of grain size, kinds of minerals, reaction, and stratification are given in the soil series descriptions and in table 14.

Topsoil is used in areas where vegetation is to be established and maintained. Suitability is affected mainly by the ease of working and spreading the soil material in preparing a seedbed and by the ability of the soil material to support plantlife. Also considered is the damage that can result at the area from which the topsoil is taken.

The ease of excavation is influenced by the thickness of suitable material, wetness, slope, and amount of stones. The ability of the soil to support plantlife is determined by texture, structure, and the amount of soluble salts or toxic substances. Organic matter in the A1 or Ap horizon greatly increases the absorption and retention of moisture and nutrients. Therefore, the soil material from these horizons should be carefully preserved for later use.

Soils rated *good* have at least 16 inches of friable loamy material at their surface. They are free of stones and cobbles, are low in content of gravel, and have gentle slopes. They are low in soluble salts that can limit or prevent plant growth. They are naturally fertile or respond well to fertilizer. They are not so wet that excavation is difficult during most of the year.

Soils rated *fair* are loose sandy soils or firm loamy or clayey soils in which the suitable material is only 8 to 16 inches thick or soils that have appreciable amounts of gravel, stones, or soluble salt.

Soils rated *poor* are very sandy soils and very firm clayey soils; soils with suitable layers less than 8 inches thick; soils having large amounts of gravel, stones, or soluble salt; steep soils; and poorly drained soils.

Although a rating of *good* is not based entirely on high content of organic matter, a surface horizon is generally preferred for topsoil because of its organic-matter content. This horizon is designated as A1 or Ap in the soil series descriptions. The absorption and retention of moisture and nutrients for plant growth are greatly increased by organic matter.

Water management

Many soil properties and site features that affect water management practices have been identified in this soil survey. In table 11 soil and site features that affect use are indicated for each kind of soil. This information is significant in planning, installing, and maintaining water control structures.

Pond reservoir areas hold water behind a dam or embankment. Soils best suited to this use have a low seepage potential, which is determined by permeability and the depth to fractured or permeable bedrock or other permeable material.

Embankments, dikes, and levees require soil material that is resistant to seepage, erosion, and piping and has favorable stability, shrink-swell potential, shear strength, and compaction characteristics. Large stones and organic matter in a soil downgrade the suitability of a soil for use in embankments, dikes, and levees.

Drainage of soil is affected by such soil properties as permeability; texture; depth to bedrock, hardpan, or other layers that affect the rate of water movement; depth to the water table; slope; stability of ditchbanks; susceptibility to flooding; salinity and alkalinity; and availability of outlets for drainage.

Irrigation is affected by such features as slope, susceptibility to flooding, hazards of water erosion and soil blowing, texture, presence of salts and alkali, depth of root zone, rate of water intake at the surface, permeability of the soil below the surface layer, available water capacity, need for drainage, and depth to the water table.

Terraces and diversions are embankments or a combination of channels and ridges constructed across a slope to intercept runoff. They allow water to soak into the soil or flow slowly to an outlet. Features that affect suitability of a soil for terraces are uniformity and steepness of slope; depth to bedrock, hardpan, or other unfavorable material; large stones; permeability; ease of establishing vegetation; and resistance to water erosion, soil blowing, soil slipping, and piping.

Grassed waterways are constructed to channel runoff to outlets at a nonerosive velocity. Features that affect the use of soils for waterways are slope, permeability, erodibility, wetness, and suitability for permanent vegetation.

Recreation

The soils of the survey area are rated in table 12 according to limitations that affect their suitability for recreation uses. The ratings are based on such restrictive soil features as flooding, wetness, slope, and texture of the surface layer. Not considered in these ratings, but important in evaluating a site, are location and accessibility of the area, size and shape of the area and its scenic quality, the ability of the soil to support vegetation, access to water, potential water impoundment sites available, and either access to public sewerlines or capacity of the soil to absorb septic tank effluent. Soils subject to flooding are limited, in varying degree, for recreation use by the duration and intensity of flooding and the season when flooding occurs. Onsite assessment of height, duration, intensity, and frequency of flooding is essential in planning recreation facilities.

The degree of the limitation of the soils is expressed as slight, moderate, or severe. *Slight* means that the soil properties are generally favorable and that the limitations are minor and easily overcome. *Moderate* means that the limitations can be overcome or alleviated by planning, design, or special maintenance. *Severe* means that soil properties are unfavorable and that limitations can be offset only by costly soil reclamation, special design, inten-

sive maintenance, limited use, or by a combination of these measures.

The information in table 12 can be supplemented by information in other parts of this survey. Especially helpful are interpretations for septic tank absorption fields, given in table 9, and interpretations for dwellings without basements and for local roads and streets, given in table 8.

Camp areas require such site preparation as shaping and leveling for tent and parking areas, stabilizing roads and intensively used areas, and installing sanitary facilities and utility lines. Camp areas are subject to heavy foot traffic and some vehicular traffic. The best soils for this use have mild slopes and are not wet or subject to flooding during the period of use. The surface has few or no stones or boulders, absorbs rainfall readily but remains firm, and is not dusty when dry. Strong slopes and stones or boulders can greatly increase the cost of constructing camping sites.

Picnic areas are subject to heavy foot traffic. Most vehicular traffic is confined to access roads and parking areas. The best soils for use as picnic areas are firm when wet, are not dusty when dry, are not subject to flooding during the period of use, and do not have slopes or stones or boulders that will increase the cost of shaping sites or of building access roads and parking areas.

Playgrounds require soils that can withstand intensive foot traffic. The best soils are almost level and are not wet or subject to flooding during the season of use. The surface is free of stones or boulders, is firm after rains, and is not dusty when dry. If shaping is required to obtain a uniform grade, the depth of the soil over bedrock or hardpan should be enough to allow necessary grading.

Paths and trails for walking, horseback riding, bicycling, and other uses should require little or no cutting and filling. The best soils for this use are those that are not wet, are firm after rains, are not dusty when dry, and are not subject to flooding more than once during the annual period of use. They should have moderate slopes and have few or no stones or boulders on the surface.

Wildlife habitat

By Eldie W. Mustard, Jr., biologist, Soil Conservation Service.

Soils directly affect the kind and amount of vegetation that is available to wildlife as food and cover, and they affect the construction of water impoundments. The kind and abundance of wildlife that populates an area depend largely on the amount and distribution of food, cover, and water. If any one of these elements is missing, is inadequate, or is inaccessible, wildlife either is scarce or does not inhabit the area.

If the soils have the potential, wildlife habitat can be created or improved by planting appropriate vegetation, by maintaining the existing plant cover, or by helping the natural establishment of desirable plants.

In table 13, the soils in the survey area are rated according to their potential to support the main kinds of wildlife habitat in the area. This information can be used in planning for parks, wildlife refuges, nature study areas, and other developments for wildlife; selecting areas that are suitable for wildlife; selecting soils that are suitable for creating, improving, or maintaining specific elements of wildlife habitat; and determining the intensity of management needed for each element of the habitat.

The potential of the soil is rated good, fair, poor, or very poor. A rating of *good* means that the element of wildlife habitat or the kind of habitat is easily created, improved, or maintained. Few or no limitations affect management, and satisfactory results can be expected if the soil is used for the designated purpose. A rating of *fair* means that the element of wildlife habitat or kind of habitat can be created, improved, or maintained in most places. Moderately intensive management is required for satisfactory results. A rating of *poor* means that limitations are severe for the designated element or kind of wildlife habitat. Habitat can be created, improved, or maintained in most places, but management is difficult and must be intensive. A rating of *very poor* means that restrictions for the element of wildlife habitat or kind of wildlife are very severe, and that unsatisfactory results can be expected. Wildlife habitat is impractical or even impossible to create, improve, or maintain on soils having such a rating.

Ratings given in table 13 are for nonirrigated soils. Where soils are irrigable, ratings can typically be raised at least one rating.

The elements of wildlife habitat are briefly described in the following paragraphs.

Grain and seed crops are seed-producing annuals used by wildlife. The major soil properties that affect the growth of grain and seed crops are depth of the root zone, texture of the surface layer, available water capacity, wetness, slope, surface stoniness, and flood hazard. Soil temperature and soil moisture are also considerations. Examples of grain and seed crops are corn, wheat, oats, barley, millet, and sunflowers.

Grasses and legumes are domestic perennial grasses and herbaceous legumes that are planted for wildlife food and cover. Major soil properties that affect the growth of grasses and legumes are depth of the root zone, texture of the surface layer, available water capacity, wetness, surface stoniness, flood hazard, and slope. Soil temperature and soil moisture are also considerations. Examples of grasses and legumes are wheatgrass, sand lovegrass, switchgrass, bromegrass, orchardgrass, clover, and alfalfa.

Wild herbaceous plants are native or naturally established grasses and forbs, including weeds, that provide food and cover for wildlife. Major soil properties that affect the growth of these plants are depth of the root zone, texture of the surface layer, available water capacity, wetness, surface stoniness, and flood hazard. Soil temperature and soil moisture are also considerations. Examples of wild herbaceous plants are bluestem, alkali

sacaton, indiangrass, galleta, wheatgrass, Arizona fescue, blue grama, sunflower, yucca, and pricklypear.

Hardwood trees are not produced commercially in the Area.

Coniferous plants are cone-bearing trees, shrubs, or ground cover plants that furnish habitat or supply food in the form of browse, seeds, or fruitlike cones. Soil properties that have a major effect on the growth of coniferous plants are depth of the root zone, available water capacity, and wetness. Examples of coniferous plants are pine, spruce, fir, cedar, and juniper.

Shrubs are bushy woody plants that produce fruit, buds, twigs, bark, or foliage used by wildlife or that provide cover and shade for some species of wildlife. Major soil properties that affect the growth of shrubs are depth of the root zone, available water capacity, salinity, and moisture. Examples of shrubs are mountainmahogany, Gambel oak, fourwing saltbush, snowberry, and fringed sage.

Wetland plants are annual and perennial wild herbaceous plants that grow on moist or wet sites, exclusive of submerged or floating aquatics. They produce food or cover for wildlife that use wetland as habitat. Major soil properties affecting wetland plants are texture of the surface layer, wetness, reaction, salinity, slope, and surface stoniness. Examples of wetland plants are smartweed, barnyardgrass, rushes, sedges, saltgrass, cordgrass, and cattail.

Shallow water areas are bodies of water that have an average depth of less than 5 feet and that are useful to wildlife. They can be naturally wet areas, or they can be created by dams or levees or by water-control structures in marshes or streams. Major soil properties affecting shallow water areas are depth to bedrock, wetness, surface stoniness, slope, and permeability. The availability of a dependable water supply is important if water areas are to be developed. Examples of shallow water areas are marshes, waterfowl feeding areas, wildlife watering developments, and ponds.

The kinds of wildlife habitat are briefly described in the following paragraphs.

Openland habitat consists of cropland, pasture, meadows, and areas that are overgrown with grasses, herbs, shrubs, and vines. These areas produce grain and seed crops, grasses and legumes, and wild herbaceous plants. The kinds of wildlife attracted to these areas include mourning dove, pheasant, meadowlark, field sparrow, cottontail rabbit, killdeer, bighorn sheep, and yellow-bellied marmot.

Woodland habitat consists of areas of hardwoods or conifers, or a mixture of both, and associated grasses, legumes, and wild herbaceous plants. Wildlife attracted to these areas include wild turkey, blue grouse, woodpeckers, tree squirrels, raccoon, mule deer, elk, and black bear.

Wetland habitat consists of open, marshy or swampy, shallow water areas where water-tolerant plants grow. Some of the wildlife attracted to such areas are ducks, geese, herons, shore birds, muskrat, rails, kingfishers, mink, and beaver.

Rangeland habitat consists of areas of wild herbaceous plants and shrubs. Wildlife attracted to rangeland include antelope, prairie dog, cottontail rabbit, mule deer, meadowlark, lark bunting, prairie rattlesnake, coyote, scaled quail, burrowing owl, and kit fox.

Soil properties

Extensive data about soil properties are summarized on the following pages. The two main sources of these data are the many thousands of soil borings made during the course of the survey and the laboratory analyses of selected soil samples from typical profiles.

In making soil borings during field mapping, soil scientists can identify several important soil properties. They note the seasonal soil moisture condition or the presence of free water and its depth. For each horizon in the profile, they note the thickness and color of the soil material; the texture, or amount of clay, silt, sand, and gravel or other coarse fragments; the structure, or the natural pattern of cracks and pores in the undisturbed soil; and the consistence of the soil material in place under the existing soil moisture conditions. They record the depth of plant roots, determine the pH, or reaction, of the soil, and identify any free carbonates.

Samples of soil material are analyzed in the laboratory to verify the field estimates of soil properties and to determine all major properties of key soils, especially properties that cannot be estimated accurately by field observation. Laboratory analyses are not conducted for all soil series in the survey area, but laboratory data for many soil series not tested are available from nearby survey areas.

The available field and laboratory data are summarized in tables. The tables give the estimated range of engineering properties, the engineering classifications, and the physical and chemical properties of each major horizon of each soil in the survey area. They also present data about pertinent soil and water features, engineering test data, and data obtained from physical and chemical laboratory analyses of soils.

Engineering properties

Table 14 gives estimates of engineering properties and classifications for the major horizons of each soil in the survey area.

Most soils have, within the upper 5 or 6 feet, horizons of contrasting properties. Table 14 gives information for each of these contrasting horizons in a typical profile. *Depth* to the upper and lower boundaries of each horizon is indicated. More information about the range in depth and about other properties in each horizon is given for each soil series in the section "Soil series and morphology."

Texture is described in table 14 in the standard terms used by the U.S. Department of Agriculture. These terms are defined according to percentages of sand, silt, and clay in soil material that is less than 2 millimeters in diameter. "Loam," for example, is soil material that is 7 to 27 percent clay, 28 to 50 percent silt, and less than 52 percent sand. If a soil contains gravel or other particles coarser than sand, an appropriate modifier is added, for example, "gravelly loam." Other texture terms are defined in the Glossary.

The two systems commonly used in classifying soils for engineering use are the Unified Soil Classification System (Unified) (*2*) and the system adopted by the American Association of State Highway and Transportation Officials (AASHTO) (*1*).

The *Unified* system classifies soils according to properties that affect their use as construction material. Soils are classified according to grain-size distribution of the fraction less than 3 inches in diameter, plasticity index, liquid limit, and organic-matter content. Soils are grouped into 15 classes—eight classes of coarse-grained soils, identified as GW, GP, GM, GC, SW, SP, SM, and SC; six classes of fine-grained soils, identified as ML, CL, OL, MH, CH, and OH; and one class of highly organic soils, identified as Pt. Soils on the borderline between two classes have a dual classification symbol, for example, CL-ML.

The *AASHTO* system classifies soils according to those properties that affect their use in highway construction and maintenance. In this system a mineral soil is classified in one of seven basic groups ranging from A-1 through A-7 on the basis of grain-size distribution, liquid limit, and plasticity index. Soils in group A-1 are coarse grained and low in content of fines. At the other extreme, in group A-7, are fine-grained soils. Highly organic soils are classified in group A-8 on the basis of visual inspection.

Also in table 14 the percentage, by weight, of rock fragments more than 3 inches in diameter is estimated for each major horizon. These estimates are determined mainly by observing volume percentage in the field and then converting that, by formula, to weight percentage.

Percentage of the soil material less than 3 inches in diameter that passes each of four sieves (U.S. standard) is estimated for each major horizon. The estimates are based on tests of soils that were sampled in the survey area and in nearby areas and on field estimates from many borings made during the survey.

Liquid limit and *plasticity index* indicate the effect of water on the strength and consistence of soil. These indexes are used in both the Unified and AASHTO soil classification systems. They are also used as indicators in making general predictions of soil behavior. Range in liquid limit and plasticity index are estimated on the basis of test data from the survey area or from nearby areas and on observations of the many soil borings made during the survey.

In some surveys, the estimates are rounded to the nearest 5 percent. Thus, if the ranges of gradation and Atterburg limits extend a marginal amount across classification boundaries (1 or 2 percent), the classification in the marginal zone is omitted.

Physical and chemical properties

Table 15 shows estimated values for several soil characteristics and features that affect behavior of soils in engineering uses. These estimates are given for each major horizon, at the depths indicated, in the typical pedon of each soil. The estimates are based on field observations and on test data for these and similar soils.

Permeability is estimated on the basis of known relationships among the soil characteristics observed in the field—particularly soil structure, porosity, and gradation or texture—that influence the downward movement of water in the soil. The estimates are for vertical water movement when the soil is saturated. Not considered in the estimates is lateral seepage or such transient soil features as plowpans and surface crusts. Permeability of the soil is an important factor to be considered in planning and designing drainage systems, in evaluating the potential of soils for septic tank systems and other waste disposal systems, and in many other aspects of land use and management.

Available water capacity is rated on the basis of soil characteristics that influence the ability of the soil to hold water and make it available to plants. Important characteristics are content of organic matter, soil texture, and soil structure. Shallow-rooted plants are not likely to use the available water from the deeper soil horizons. Available water capacity is an important factor in the choice of plants or crops to be grown and in the design of irrigation systems.

Soil reaction is expressed as range in pH values. The range in pH of each major horizon is based on many field checks. For many soils, the values have been verified by laboratory analyses. Soil reaction is important in selecting the crops, ornamental plants, or other plants to be grown; in evaluating soil amendments for fertility and stabilization; and in evaluating the corrosivity of soils.

Salinity is expressed as the electrical conductivity of the saturation extract, in millimhos per centimeter at 25 degrees C. Estimates are based on field and laboratory measurements at representative sites of the nonirrigated soils. The salinity of individual irrigated fields is affected by the quality of the irrigation water and by the frequency of water application. Hence, the salinity of individual fields can differ greatly from the value given in table 15. Salinity affects the suitability of a soil for crop production, its stability when used as a construction material, and its potential to corrode metal and concrete.

Shrink-swell potential depends mainly on the amount and kind of clay in the soil. Laboratory measurements of the swelling of undisturbed clods were made for many soils. For others the swelling was estimated on the basis

of the kind and amount of clay in the soil and on measurements of similar soils. The size of the load and the magnitude of the change in soil moisture content also influence the swelling of soils. Shrinking and swelling of some soils can cause damage to building foundations, basement walls, roads, and other structures unless special designs are used. A high shrink-swell potential indicates that special design and added expense may be required if the planned use of the soil will not tolerate large volume changes.

Risk of corrosion pertains to potential soil-induced chemical action that dissolves or weakens uncoated steel or concrete. The rate of corrosion of uncoated steel is related to soil moisture, particle-size distribution, total acidity, and electrical conductivity of the soil material. The rate of corrosion of concrete is based mainly on the sulfate content, texture, and acidity of the soil. Protective measures for steel or more resistant concrete help to avoid or minimize damage resulting from the corrosion. Uncoated steel intersecting soil boundaries or soil horizons is more susceptible to corrosion than an installation that is entirely within one kind of soil or within one soil horizon.

Erosion factors are used to predict the erodibility of a soil and its tolerance to erosion in relation to specific kinds of land use and treatment. The soil erodibility factor (K) is a measure of the susceptibility of the soil to erosion by water. Soils having the highest K values are the most erodible. K values range from 0.10 to 0.64. To estimate annual soil loss per acre, the K value of a soil is modified by factors representing plant cover, grade and length of slope, management practices, and climate. The soil-loss tolerance factor (T) is the maximum rate of soil erosion, whether from rainfall or soil blowing, that can occur
quality. The rate is expressed in tons of soil loss per acre per year.

Wind erodibility groups are made up of soils that have similar porperties that affect their resistance to soil blowing if cultivated. The groups are used to predict the susceptibility of soil to blowing and the amount of soil lost as a result of blowing. Soils are grouped according to the following distinctions:

1. Sands, coarse sands, fine sands, and very fine sands. These soils are extremely erodible, so vegetation is difficult to establish. They are generally not suitable for crops.

2. Loamy sands, loamy fine sands, and loamy very fine sands. These soils are very highly erodible, but crops can be grown if intensive measures to control soil blowing are used.

3. Sandy loams, coarse sandy loams, fine sandy loams, and very fine sandy loams. These soils are highly erodible, but crops can be grown if intensive measures to control soil blowing are used.

4L. Calcareous loamy soils that are less than 35 percent clay and more than 5 percent finely divided calcium carbonate. These soils are erodible, but crops can be grown if intensive measures to control soil blowing are used.

4. Clays, silty clays, clay loams, and silty clay loams that are more than 35 percent clay. These soils are moderately erodible, but crops can be grown if measures to control soil blowing are used.

5. Loamy soils that are less than 18 percent clay and less than 5 percent finely divided calcium carbonate and sandy clay loams and sandy clays that are less than 5 percent finely divided calcium carbonate. These soils are slightly erodible, but crops can be grown if measures to control soil blowing are used.

6. Loamy soils that are 18 to 35 percent clay and less than 5 percent finely divided calcium carbonate, except silty clay loams. These soils are very slightly erodible, and crops can easily be grown.

7. Silty clay loams that are less than 35 percent clay and less than 5 percent finely divided calcium carbonate. These soils are very slightly erodible, and crops can easily be grown.

8. Stony or gravelly soils and other soils not subject to soil blowing.

Soil and water features

Table 16 contains information helpful in planning land uses and engineering projects that are likely to be affected by soil and water features.

Hydrologic soil groups are used to estimate runoff from precipitation. Soils not protected by vegetation are placed in one of four groups on the basis of the intake of water after the soils have been wetted and have received precipitation from long-duration storms.

The four hydrologic soil groups are:

Group A. Soils having a high infiltration rate (low runoff potential) when thoroughly wet. These consist chiefly of deep, well drained to excessively drain sands or gravels. These soils have a high rate of water transmission.

Group B. Soils having a moderate infiltration rate when thoroughly wet. These consist chiefly of moderately deep or deep, moderately well drained or well drained soils that have moderately fine texture to moderately coarse texture. These soils have a moderate rate of water transmission.

Group C. Soils having a slow infiltration rate when thoroughly wet. These consist chiefly of soils that have a layer that impedes the downward movement of water or soils that have moderately fine texture or fine texture. These soils have a slow rate of water transmission.

Group D. Soils having a very slow infiltration rate (high runoff potential) when thoroughly wet. These consist chiefly of clay soils that have a high shrink-swell potential, soils that have a permanent high water table, soils that have a claypan or clay layer at or near the surface, and soils that are shallow over nearly impervious material. These soils have a very slow rate of water transmission.

Flooding is the temporary covering of soil with water from overflowing streams, with runoff from adjacent

slopes, and by tides. Water standing for short periods after rains or after snow melts is not considered flooding, nor is water in swamps and marshes. Flooding is rated in general terms that describe the frequency and duration of flooding and the time of year when flooding is most likely. The ratings are based on evidence in the soil profile of the effects of flooding, namely thin strata of gravel, sand, silt, or, in places, clay deposited by floodwater; irregular decrease in organic-matter content with increasing depth; and absence of distinctive soil horizons that form in soils of the area that are not subject to flooding. The ratings are also based on local information about floodwater levels in the area and the extent of flooding and on information that relates the position of each soil on the landscape to historic floods.

The generalized description of flood hazards is of value in land-use planning and provides a valid basis for land-use restrictions. The soil data are less specific, however, than those provided by detailed engineering surveys that delineate flood-prone areas at specific flood frequency levels.

Depth to bedrock is shown for all soils that are underlain by bedrock at a depth of 5 to 6 feet or less. For many soils, the limited depth to bedrock is a part of the definition of the soil series. The depths shown are based on measurements made in many soil borings and on other observations made during the mapping of the soils. The kind of bedrock and its hardness as related to ease of excavation is also shown. Rippable bedrock can be excavated with a single-tooth ripping attachment on a 200-horsepower tractor, but hard bedrock generally requires blasting.

Potential frost action refers to the likelihood of damage to pavements and other structures by frost heaving and low soil strength after thawing. Frost action results from the movement of soil moisture into the freezing temperature zone in the soil, which causes ice lenses to form. Soil texture, temperature, moisture content, porosity, permeability, and content of organic matter are the most important soil properties that affect frost action. It is assumed that the soil is not covered by insulating vegetation or snow and is not artificially drained. Silty and clayey soils that have a high water table in winter are most susceptible to frost action. Well drained very gravelly or sandy soils are the least susceptible.

Soil series and morphology

In this section, each soil series recognized in the survey area is described in detail. The descriptions are arranged in alphabetic order by series name.

Characteristics of the soil and the material in which it formed are discussed for each series. The soil is then compared to similar soils and to nearby soils of other series. Then a pedon, a small three-dimensional area of soil typical of the soil series in the survey area, is described. The detailed descriptions of each soil horizon follows standards presented in the Soil Survey Manual (*3*). Unless otherwise noted, colors described are for dry soil.

Following the pedon description is the range of important characteristics of the soil series in this survey area. Phases, or mapping units, of each soil series are described in the section "Soil maps for detailed planning."

Alamosa series

The Alamosa series consists of deep, poorly drained soils that formed in alluvium on flood plains and fans. These soils have slopes of 1 to 3 percent. Average annual precipitation is about 18 inches, and average annual air temperature is about 42 degrees F.

Alamosa soils are similar to Fluvaquentic Haplaquolls, nearly level, and are near Ellicott, Cruckton, Peyton, and Pring soils. Fluvaquentic Haplaquolls are coarser textured and are in a warmer temperature zone than Alamosa soils. Ellicott, Cruckton, Peyton, and Pring soils are noncalcareous. Ellicott and Pring soils do not have an argillic horizon.

Typical pedon of Alamosa loam, 1 to 3 percent slopes, in the Bijou Basin, about 270 feet south and 600 feet west of the northeast corner of sec. 8, T. 11 S., R. 63 W.:

A1—0 to 6 inches; dark gray (10YR 4/1) loam, very dark gray (10YR 3/1) moist; moderate fine and medium crumb structure; slightly hard, friable; many fine and very fine roots; neutral; abrupt smooth boundary.

B21t—6 to 14 inches; very dark gray (10YR 3/1) clay loam, black (10YR 2/1) moist; weak fine and medium prismatic structure parting to moderate fine subangular blocky; hard, friable, sticky; moderately thick clay films on faces of peds; neutral; gradual smooth boundary.

B22t—14 to 24 inches; gray (10YR 5/1) clay loam, black (10YR 2/1) moist; moderate coarse prismatic structure parting to strong medium subangular blocky; very hard, firm, sticky and plastic; moderately thick clay films on faces of peds; some soft lime nodules; calcareous; moderately alkaline; gradual smooth boundary.

B3ca—24 to 33 inches; gray (10YR 5/1) clay loam, very dark gray (10YR 3/1) moist; weak medium prismatic structure parting to moderate medium subangular blocky; very hard, firm, sticky and plastic; thin clay films on faces of peds; calcareous; moderately alkaline; gradual wavy boundary.

Cg1—33 to 41 inches; gray (5Y 5/1) sandy clay loam, dark gray (5Y 4/1) moist; few mottles and yellowish red (5YR 5/6) streaks; massive; slightly hard, friable, slightly sticky and slightly plastic; calcareous; moderately alkaline; clear wavy boundary.

Cg2—41 to 53 inches; sandy clay loam, dark greenish gray (5GY 4/1) moist; streaks of yellowish red (5YR 5/6); massive; slightly hard, friable, slightly sticky and slightly plastic; moderately alkaline; clear wavy boundary.

Cg3—53 to 60 inches; light gray (5Y 7/2) sandy loam, olive gray (5Y 5/2) moist; streaks of yellowish red (5YR 5/6); massive; slightly hard, very friable; moderately alkaline.

The solum ranges from 24 to 50 inches in thickness. It is 0 to 15 percent coarse fragments. The A1 horizon is slightly acid or neutral. The B2t horizon is very dark gray or gray loam to clay loam. It ranges from neutral to moderately alkaline. The C horizon is dark greenish gray, gray, and light gray. It is mildly alkaline or moderately alkaline.

Ascalon series

The Ascalon series consists of deep, well drained soils that formed in mixed alluvium and wind-laid materials.

These soils are on uplands. They have slopes of 1 to 9 percent. Average annual precipitation is about 15 inches, and average annual air temperature is about 48 degrees F.

Ascalon soils are similar to Bresser and Satanta soils. Ascalon soils are near Fort Collins, Olney, Vona, and competing Bresser soils. Bresser soils are noncalcareous. Satanta soils have a B2t horizon that averages 35 percent fine or coarser sand. Fort Collins, Olney, and Vona soils have a light colored A horizon.

Typical pedon of Ascalon sandy loam, 1 to 3 percent slopes, 0.3 mile south and 100 feet east of the northwest corner of sec. 26, T. 17 S., R. 63 W.:

A1—0 to 8 inches; brown (10YR 5/3) sandy loam, dark brown (10YR 3/3) moist; moderate fine granular structure; soft, very friable; neutral; clear smooth boundary.

B1—8 to 13 inches; brown (10YR 5/3) sandy clay loam, dark brown (10YR 3/3) moist; weak medium prismatic structure parting to moderate medium subangular blocky; slightly hard, very friable, slightly sticky; neutral; clear wavy boundary.

B21t—13 to 16 inches; yellowish brown (10YR 5/4) sandy clay loam, dark yellowish brown (10YR 3/4) moist; moderate medium prismatic structure parting to moderate medium subangular blocky; very hard, friable, sticky and plastic; thin clay films on faces of peds; neutral; clear smooth boundary.

B22t—16 to 21 inches; pale brown (10YR 6/3) sandy clay loam, brown (10YR 4/3) moist; moderate medium prismatic structure parting to moderate medium subangular blocky; hard, friable, sticky and plastic; thin clay films on faces of peds; neutral; clear smooth boundary.

B3—21 to 30 inches; pale brown (10YR 6/3) sandy loam, brown (10YR 4/3) moist; weak medium prismatic structure parting to weak medium subangular blocky; slightly hard, very friable; calcareous; mildly alkaline; gradual smooth boundary.

C1ca—30 to 48 inches; very pale brown (10YR 7/3) sandy loam, brown (10YR 5/3) moist; massive; slightly hard, very friable; visible lime occurring as soft nodules and streaks; calcareous; moderately alkaline; gradual smooth boundary.

C2ca—48 to 60 inches; very pale brown (10YR 7/3) loamy sand, brown (10YR 5/3) moist; massive; slightly hard, very friable; visible lime occurring as soft nodules and streaks; calcareous; moderately alkaline.

The solum ranges from 15 to 40 inches in thickness. It is 0 to 15 percent coarse fragments. It is neutral or mildly alkaline.

The A1 horizon is grayish brown or brown sandy loam or fine sandy loam. The B2t horizon is pale brown, yellowish brown, or brown. It is commonly sandy clay loam but ranges from loam to clay loam. The C horizon is mildly alkaline or moderately alkaline.

Bernal series

The Bernal series consists of shallow, well drained soils that formed in material weathered from arkosic sandstone and modified by eolian sediment. They are on ridges and hills. They have slopes of 3 to 20 percent. Average annual precipitation is about 15 inches, and average annual air temperature is about 47 degrees F.

Bernal soils are similar to Paunsaugunt, Penrose, and Travessilla soils and are near Blakeland, Bresser, Louviers, and Truckton soils. Paunsaugunt soils have more than 35 percent coarse fragments in the control section, do not have a B2t horizon, and are in a colder temperature zone than Bernal soils. Penrose soils are light colored, do not have a B2t horizon, and are 0 to 35 percent coarse fragments. Paunsaugunt and Penrose soils are underlain by limestone bedrock. Travessilla soils have 0 to 35 percent coarse fragments in the control secion, are calcareous or noncalcareous, and do not have a B2t horizon. Blakeland soils are deep and do not have a B2t horizon. Bresser soils are deep and have a finer textured B2t horizon than Bernal soils. Louviers soils are more than 35 percent clay throughout. Truckton soils are deep.

Typical pedon of a Bernal sandy loam (fig. 8) in an area of Stapleton-Bernal sandy loams, 3 to 20 percent slopes, near the east quarter corner of sec. 36, T. 13 S., R. 66 W.:

A1—0 to 4 inches; dark grayish brown (10YR 4/2) sandy loam, very dark grayish brown (10YR 3/2) moist; moderate fine granular structure; soft, very friable; common fine roots; neutral; clear smooth boundary.

B2t—4 to 11 inches; brown (10YR 4/3) sandy clay loam, dark brown (10YR 3/3) moist; moderate medium prismatic structure parting to moderate medium subangular blocky; very hard, friable, slightly sticky and slightly plastic; thin clay films on faces of peds; neutral; clear smooth boundary.

C—11 to 13 inches; brown (10YR 5/3) sandy loam, dark brown (10YR 4/3) moist; weak medium blocky structure; extremely hard, firm; neutral; abrupt smooth boundary.

R—13 inches; hard, light colored sandstone.

Thickness of the solum and depth to bedrock range from 8 to 20 inches. The solum is 0 to 15 percent coarse fragments. It is neutral or mildly alkaline. The A1 horizon is grayish brown or dark grayish brown. The B2t horizon is brown or dark brown heavy sandy loam to sandy clay loam.

Bijou series

The Bijou series consists of deep, well drained and somewhat excessively drained soils that formed in sandy alluvium and in eolian material derived from arkose deposits. These soils are on flood plains, uplands, and terraces. The soils have slopes of 1 to 8 percent. Average annual precipitation is about 13 inches, and average annual air temperature is about 49 degrees F.

Bijou soils are similar to Terry and Vona soils and are near Blakeland, Bresser, and Truckton soils. Terry soils have bedrock above a depth of 40 inches and are calcareous in the lower part of the solum and in the C horizon. Vona soils are deep and are calcareous above a depth of 40 inches. Blakeland, Bresser, and Truckton soils have a mollic epipedon. Blakeland soils do not have an argillic horizon. Bresser soils have 18 to 35 percent clay in the B2t horizon, and Truckton soils have less than 18 percent clay in the B2t horizon.

Typical pedon of Bijou sandy loam, 1 to 3 percent slopes, about 100 feet north and 200 feet west of the southeast corner of sec. 11, T. 15 S., R. 63 W.:

A1—0 to 4 inches; brown (10YR 4/3) sandy loam, dark brown (10YR 3/3) moist; moderate fine granular structure; soft, very friable; neutral; clear smooth boundary.

B1—4 to 8 inches; brown (10YR 5/3) sandy loam, dark brown (10YR 4/3) moist; weak coarse prismatic structure parting to moderate medium subangular blocky; hard, very friable; neutral; clear smooth boundary.

B2t—8 to 21 inches; grayish brown (10YR 5/2) sandy loam, dark grayish brown (10YR 4/2) moist; moderate coarse prismatic structure parting to moderate medium subangular blocky; very hard, firm, slightly sticky; thin patchy clay films on faces of peds; neutral; clear smooth boundary.

B3—21 to 28 inches; brown (10YR 5/3) sandy loam, dark brown (10YR 4/3) moist; weak coarse prismatic structure parting to weak fine and medium subangular blocky; slightly hard, very friable; neutral; clear smooth boundary.

C1—28 to 60 inches; pale brown (10YR 6/3) loamy coarse sand, dark brown (10YR 4/3) moist; massive; hard, very friable; neutral.

The solum ranges from 21 to 40 inches in thickness. It is 0 to 15 percent coarse fragments. It ranges from slightly acid to mildly alkaline. The A1 horizon is brown or grayish brown sandy loam or loamy sand. The B2t horizon is brown or grayish brown sandy loam to coarse sandy loam. The C horizon is pale brown or brown.

Blakeland series

The Blakeland series consists of deep, somewhat excessively drained soils. These soils formed in arkosic sandy alluvium and eolian sediment on uplands. They have slopes of 1 to 20 percent. Average annual precipitation is about 15 inches, and average annual air temperature is about 47 degrees F.

Blakeland soils are similar to Chaseville, Columbine, and Connerton soils. They are near Bresser and Truckton soils. Chaseville soils have hue of 7.5YR to 10R. Columbine soils have hue of 5Y to 7.5YR and have a control section that is 18 to 35 percent clay. Bresser soils have a B2t horizon that is 18 to 35 percent clay. Truckton soils have a B2t horizon that is 5 to 18 percent clay.

Typical pedon of Blakeland loamy sand, 1 to 9 percent slopes, 1,990 feet north and 1,730 feet west of the southeast corner of sec. 4, T. 14 S., R. 65 W.:

A1—0 to 11 inches; dark grayish brown (10YR 4/2) loamy sand, very dark grayish brown (10YR 3/2) moist; moderate fine granular structure; slightly hard, very friable; slightly acid; clear smooth boundary.

AC—11 to 27 inches; brown (10YR 5/3) loamy sand, dark brown (10YR 4/3) moist; weak coarse prismatic structure parting to weak fine granular; very hard, very friable; neutral; gradual smooth boundary.

C—27 to 60 inches; pale brown (10YR 6/3) sand, brown (10YR 5/3) moist; massive; very hard, very friable; neutral.

The solum ranges from 8 to 20 inches in thickness. It is 0 to 15 percent coarse fragments. It ranges from slightly acid to mildly alkaline. The A1 horizon is dark grayish brown or brown. The AC horizon is brown loamy sand or loamy coarse sand. The C horizon is pale brown to light yellowish brown.

Blendon series

The Blendon series consists of deep, well drained soils that formed in sandy arkosic alluvium. These soils are on terraces, on flood plains, and in drainageways. They have slopes of 0 to 3 percent. Average annual precipitation is about 15 inches, and average annual air temperature is about 47 degrees F.

Blendon soils are similar to Bresser and Truckton soils. They are near Bijou and Blakeland soils. Bresser, Truckton, and Blakeland soils have a mollic epipedon less than 20 inches thick. Bresser soils have a B2t horizon that is 18 to 35 percent clay. Blakeland soils have an AC horizon. Bijou soils lack a mollic epipedon.

Typical pedon of Blendon sandy loam, 0 to 3 percent slopes, about 780 feet east and 30 feet south of fence and east of road that intersects the section line near the northwest quarter of sec. 21, T. 13 S., R. 65 W.:

A11—0 to 6 inches; dark grayish brown (10YR 4/2) sandy loam, very dark brown (10YR 2/2) moist; weak fine granular structure; soft, very friable; 5 percent fine gravel; slightly acid; clear smooth boundary.

A12—6 to 10 inches; dark grayish brown (10YR 3/2) sandy loam, very dark brown (10YR 2/2) moist; weak medium and fine subangular blocky structure parting to moderate medium and fine granular; hard, very friable; 5 percent gravel; neutral; gradual smooth boundary.

B2—10 to 23 inches; dark grayish brown (10YR 4/2) sandy loam, very dark brown (10YR 2/2) moist; weak coarse prismatic structure parting to weak medium subangular blocky; extremely hard, friable; 10 percent gravel; neutral; gradual smooth boundary.

B3—23 to 36 inches; brown (10YR 4/3) sandy loam, dark brown (10YR 3/3) moist; weak coarse subangular blocky structure; very hard, very friable; 10 percent gravel; neutral; clear wavy boundary.

C—36 to 60 inches; light brownish gray (10YR 6/2) gravelly sandy loam, grayish brown (10YR 5/2) moist; massive; hard, friable; 30 percent gravel; neutral.

The solum ranges from 26 to 40 inches in thickness. It is 0 to 20 percent coarse fragments. It is slightly acid or neutral. The A1 horizon is dark grayish brown or brown sandy loam or fine sandy loam. The B2 horizon is dark grayish brown or brown sandy loam to fine sandy loam. The C horizon is light brownish gray or pale brown.

Bresser series

The Bresser series consists of deep, well drained soils that formed in alluvium and residuum derived from arkosic sedimentary rock. These soils are on uplands. They have slopes of 0 to 20 percent. Average annual precipitation is about 15 inches, and average annual air temperature is about 47 degrees F.

Bresser soils are similar to Ascalon and Satanta soils and are near Blakeland and Truckton soils. Ascalon and Satanta soils are calcareous in part of the solum and in the C horizon. Blakeland soils do not have a B2t horizon and are coarse textured throughout. Truckton soils have a B2t horizon that is less than 18 percent clay.

Typical pedon of Bresser sandy loam, 3 to 5 percent slopes, about 0.1 mile south and 200 feet east of the northwest corner of sec. 9, T. 11 S., R. 62 W.:

A1—0 to 5 inches; grayish brown (10YR 5/2) sandy loam, very dark grayish brown (10YR 3/2) moist; moderate fine granular structure; soft, very friable; neutral; clear smooth boundary.

B1—5 to 8 inches thick; grayish brown (10YR 5/2) sandy loam, very dark grayish brown (10YR 3/2) moist; weak coarse prismatic structure parting to moderate medium subangular blocky; hard, very friable; few thin patchy clay films on faces of peds; neutral; clear smooth boundary.

B21t—8 to 12 inches; brown (10YR 4/3) sandy clay loam, dark brown (10YR 3/3) moist; moderate medium prismatic structure parting to moderate medium subangular blocky; thin continuous clay films on faces of peds; neutral; gradual smooth boundary.

B22t—12 to 27 inches; brown (10YR 5/3) sandy clay loam, dark brown (10YR 4/3) moist; moderate medium prismatic structure parting to moderate to strong subangular blocky; very hard, friable, slightly

sticky and slightly plastic; moderately thick continuous clay films on faces of peds; neutral; gradual smooth boundary.

B3—27 to 36 inches; yellowish brown (10YR 5/4) sandy loam, dark yellowish brown (10YR 4/4) moist; weak coarse prismatic structure parting to moderate medium subangular blocky; few thin clay films on faces of peds and in root channels; neutral; gradual smooth boundary.

C—36 to 60 inches; light yellowish brown (2.5Y 6/4) loamy coarse sand, light olive brown (2.5Y 5/4) moist; massive; hard, very friable; 10 percent fine gravel; neutral.

The solum ranges from 19 to 40 inches in thickness. It is 0 to 15 percent coarse fragments. It is slightly acid or neutral. The A1 horizon is grayish brown or dark grayish brown sandy loam or coarse sandy loam. The B2t horizon is grayish brown or brown sandy clay loam to clay loam. The C horizon is pale brown, light brownish gray, or light yellowish brown. It is 0 to 35 percent coarse fragments.

Broadmoor series

The Broadmoor series consists of moderately deep, somewhat excessively drained soils that formed in residuum derived from fractured granite. These soils are on mountains. They have slopes of 25 to 70 percent. Average annual precipitation is about 20 inches, and average annual air temperature is about 42 degrees F.

Broadmoor soils are similar to Nederland soils and are near Kutler, Coldcreek, and Tecolote soils. Nederland soils are deep and have a B2t horizon. Kutler soils are dark colored. Coldcreek and Tecolote soils have a B2t horizon.

Typical pedon of a Broadmoor extremely gravelly sandy loam in an area of Kutler-Broadmoor-Rock outcrop complex, 25 to 90 percent slopes, about 2.7 miles west on Old Stage Road from intersection with Penrose Boulevard in southeast quarter of sec. 3, T. 15 S., R. 67 W.:

O1—2 inches to 1 inch; undecomposed organic material, mostly needles, bark, and twigs.

O2—1 inch to 0; partially decomposed organic material.

A2—0 to 15 inches; grayish brown (10YR 5/2) extremely gravelly sandy loam, dark grayish brown (10YR 4/2) moist; weak medium granular structure; soft, very friable, slightly sticky and slightly plastic; 60 percent gravel; medium acid; gradual smooth boundary.

B2—15 to 28 inches; brown (7.5YR 5/4) extremely gravelly sandy loam, brown (7.5YR 4/4) moist; weak medium granular structure; slightly hard, very friable, slightly sticky; 70 percent gravel; slightly acid; gradual smooth boundary.

Cr—28 inches; highly weathered granite.

The solum ranges from 20 to 40 inches in thickness. It is 35 to 80 percent coarse fragments. It is medium acid or slightly acid. The A2 horizon is grayish brown or light brownish gray very gravelly sandy loam or extremely gravelly sandy loam. The B2 horizon is brown or light brown very gravelly sandy loam to extremely gravelly sandy loam.

Brussett series

The Brussett series consists of deep, well drained soils that formed in eolian deposits of silt loam or loam. These soils are on uplands. They have slopes of 1 to 5 percent. Average annual precipitation is about 18 inches, and average annual air tempeature is about 43 degrees F.

Brussett soils are similar to Holderness soils and are near Jarre and Peyton soils. Holderness soils have a B2t horizon that is more than 35 percent clay. Jarre and Peyton soils have a B2t horizon that is 18 to 35 percent clay and is more than 15 percent fine sand or coarser material.

Typical pedon of Brussett loam, 3 to 5 percent slopes, about 50 feet south and 400 feet west of the northeast corner of the northwest quarter of sec. 3, T. 11 S., R. 65 W.:

A1—0 to 8 inches; dark grayish brown (10YR 4/2) loam, very dark grayish brown (10YR 3/2) moist; moderate fine granular structure; soft, very friable; slightly acid; clear smooth boundary.

B1—8 to 12 inches; dark grayish brown (10YR 4/2) loam, very dark grayish brown (10YR 3/2) moist; weak coarse prismatic structure parting to weak medium subangular blocky; slightly hard, very friable; few thin patchy clay films on vertical faces of peds; slightly acid; clear smooth boundary.

B21t—12 to 17 inches; grayish brown (10YR 5/2) clay loam, dark grayish brown (10YR 4/2) moist; moderate medium prismatic structure parting to moderate fine subangular blocky; hard, friable, sticky; thin continuous clay films on faces of peds; neutral; gradual smooth boundary.

B22t—17 to 26 inches; brown (10YR 5/3) clay loam, dark brown (10YR 4/3) moist; moderate medium prismatic structure parting to moderate medium subangular blocky; very hard, friable, sticky; thin continuous clay films on faces of peds; neutral; gradual smooth boundary.

B3—26 to 34 inches; pale brown (10YR 6/3) clay loam, brown (10YR 5/3) moist; weak coarse prismatic structure parting to moderate medium subangular blocky; thin patchy clay films on faces of peds; neutral; clear smooth boundary.

Cca—34 to 60 inches; pale brown (10YR 6/3) silt loam, brown (10YR 5/3) moist; weak coarse prismatic structure; slightly hard, very friable; common lime mycelia and soft masses; calcareous; moderately alkaline.

The solum ranges from 28 to 42 inches in thickness. It ranges from slightly acid to moderately alkaline. The A1 horizon is dark grayish brown or brown loam to clay loam. The C horizon is pale brown or light yellowish brown.

Chaseville series

The Chaseville series consists of deep, somewhat excessively drained soils that formed in arkosic alluvial sediment. These soils are on alluvial fans, terraces, and side slopes. They have slopes of 1 to 40 percent or more. Average annual precipitation is about 17 inches, and average annual air temperature is about 47 degrees F.

Chaseville soils are similar to Columbine soils and are near Bresser, Ellicott, and Truckton soils. Columbine soils have hue of 10YR to 5Y. Bresser and Truckton soils have a B2t horizon. Ellicott soils have a light colored A horizon.

Typical pedon of Chaseville gravelly sandy loam, 1 to 8 percent slopes, in the southeast quarter of sec. 15, T. 13 S., R. 67 W.:

A11—0 to 6 inches; dark grayish brown (10YR 4/2) gravelly sandy loam, very dark brown (10YR 2/2) moist; moderate medium granular structure; slightly hard, very friable; 20 percent angular granitic gravel; neutral; gradual smooth boundary.

A12—6 to 19 inches; dark grayish brown (10YR 4/2) very gravelly sandy loam, very dark grayish brown (10YR 3/2) moist; weak medium subangular blocky structure parting to moderate medium granular; hard, very friable; 50 percent angular granitic gravel; neutral; gradual smooth boundary.

C1—19 to 40 inches; reddish gray (5YR 5/2) extremely gravelly loamy coarse sand, dark reddish gray (5YR 4/2) moist; single grained; loose; 70 percent fine angular granitic gravel; neutral; gradual smooth boundary.

C2—40 to 60 inches; brown (7.5YR 4/2) very gravelly loamy sand, dark brown (7.5YR 3/2) moist; single grained; loose; 50 percent angular granitic gravel and about 10 percent cobbles; neutral.

These soils are 20 to 70 percent coarse fragments. The A horizon ranges from 10 to 20 inches in thickness. The A1 horizon is dark grayish brown or reddish brown gravelly sandy loam or very gravelly sandy loam. The C horizon is brown, reddish gray, or reddish brown.

Coldcreek series

The Coldcreek series consists of deep, well drained soils that formed in mixed acid igneous material. These soils are on mountains. They have slopes of 9 to 90 percent. Average annual precipitation is about 25 inches, and average annual temperature is about 42 degrees F.

Coldcreek soils are similar to Tecolote soils. They are near Tolman soils. Tecolote soils do not have bedrock above a depth of 60 inches. Tolman soils have bedrock at a depth of 10 to 20 inches.

Typical pedon of a Coldcreek cobbly loam in an area of Rock outcrop-Coldcreek-Tolman complex, 9 to 90 percent slopes, about 2,000 feet south and 2,000 feet west of the northeast corner of sec. 16, T. 16, R. 67 W.:

A1—0 to 6 inches; dark gray (10YR 4/1) cobbly loam, very dark gray (10YR 3/1) moist; moderate medium granular structure; soft, very friable; 15 percent gravel; 20 percent angular cobbles and stones; neutral; clear wavy boundary.

A&B—6 to 31 inches; light gray (10YR 7/2) extremely cobbly sandy loam, grayish brown (10YR 5/2) moist; moderate medium granular structure; slightly hard, very friable; varying amounts of clay loam that is brown (7.5YR 4/4) moist; weak medium subangular blocky structure; slightly hard, friable; 35 percent gravel and 30 percent angular cobbles and stones; slightly acid; diffuse broken boundary.

B&A—31 to 43 inches; brown (7.5YR 5/4) extremely cobbly clay loam, dark brown (7.5YR 4/4) moist; moderate fine and medium subangular blocky structure; slightly hard, friable, slightly sticky and slightly plastic; some peds have coatings of light gray (10YR 7/2) sandy loam, grayish brown (10YR 5/2) moist; thin patchy clay films on faces of peds; 30 percent gravel, 45 percent angular cobbles and stones; neutral; gradual broken boundary.

R—43 to 85 inches; fractured bedrock; brown (7.5YR 4/4) clay coatings on surface of rock.

The solum ranges from 40 to 60 inches in thickness. It is 35 to 80 percent coarse fragments. It ranges from medium acid to neutral. The A1 horizon is dark gray to very dark gray gravelly loam or cobbly loam. The B&A horizon is brown or dark brown very gravelly or very cobbly clay loam.

Columbine series

The Columbine series consists of deep, well drained to excessively drained soils that formed in very gravelly arkosic alluvium. These soils are on terraces, flood plains, and alluvial fans and in drainageways. They have slopes of 0 to 3 percent. Average annual precipitation is about 15 inches, and average annual air temperature is about 47 degrees F.

Columbine soils are similar to Chaseville soils and are near Ellicott and Pring soils. Chaseville soils have hue of 5YR to 10R. Ellicott soils have a light colored surface layer. Pring soils are less than 35 percent gravel and have a mean annual soil temperature of less than 47 degrees F.

Typical pedon of Columbine gravelly sandy loam, 0 to 3 percent slopes, approximately 1/2 mile northeast of the Black Squirrel bridge on U. S. Highway 24, near center of sec. 13, T. 12 S., R. 64 W.:

A11—0 to 6 inches; grayish brown (10YR 5/2) gravelly sandy loam, very dark grayish brown (10YR 3/2) moist; moderate fine granular structure; soft, very friable; 20 percent fine angular gravel; neutral; gradual smooth boundary.

A12—6 to 14 inches; brown (10YR 5/3) very gravelly loamy sand, dark brown (10YR 3/3) moist; weak medium granular structure; slightly hard; very friable; 40 percent fine angular gravel; neutral; gradual wavy boundary.

C—14 to 60 inches; light yellowish brown (2.5Y 6/4) very gravelly loamy sand, light olive brown (2.5Y 5/4) moist; massive; hard, very friable; 60 percent fine angular gravel; neutral.

The solum ranges from 10 to 20 inches in thickness. The control section is 35 to 75 percent coarse fragments. It ranges from slightly acid to mildly alkaline. The A1 horizon is grayish brown, brown, or dark grayish brown. The C horizon is light yellowish brown to yellowish brown.

Connerton series

The Connerton series consists of deep, well drained soils that formed in alluvium derived from reddish sandstone on moderately sloping alluvial fans and valley side slopes. They have slopes of 8 to 30 percent. Average annual precipitation is about 16 inches, and average annual air temperature is about 47 degrees F.

Connerton soils are similar to Blakeland and Columbine soils. They are near Chaseville and Fortwingate soils. Blakeland soils have a loamy sand control section. Columbine soils have more than 35 percent coarse fragments in the control section. Blakeland and Columbine soils have hue of 7.5YR to 5Y. Chaseville soils have a control section that is more than 35 percent coarse fragments. Fortwingate soils have a B2t horizon that is more than 35 percent clay and have bedrock at a depth of 20 to 40 inches.

Typical pedon of a Connerton loam in an area of Connerton-Rock outcrop complex, 8 to 90 percent slopes, on road cut along Crystal Park Road in the southwest quarter of sec. 9, T. 14 S., R. 67 W.:

A11—0 to 5 inches; reddish brown (5YR 4/3) loam, dark reddish brown (5YR 3/3) moist; moderate fine granular structure; slightly hard, very friable; 5 percent fine gravel; mildly alkaline; clear smooth boundary.

A12—5 to 13 inches; reddish brown (5YR 4/3) sandy clay loam, dark reddish brown (5YR 3/3) moist; moderate medium and fine subangular blocky structure; hard, friable, sticky and plastic; 5 percent fine angular gravel; mildly alkaline; clear smooth boundary.

C—13 to 72 inches; reddish brown (2.5YR 4/4) sandy clay loam, dark reddish brown (2.5YR 3/4) moist; moderate coarse subangular blocky structure; extremely hard, firm, sticky and plastic; few fine angular pebbles; moderately alkaline.

The solum ranges from 10 to 20 inches in thickness. Its content of coarse fragments ranges from 0 to 15 percent but is commonly less than 5 percent. It is mildly alkaline or moderately alkaline. The A1 and C horizons are reddish brown or weak red.

Crowfoot series

The Crowfoot series consists of deep, well drained soils that formed in sediment weathered from arkosic sandstone. These soils are on uplands. They have slopes of 3 to 15 percent. Average annual precipitaion is about 17 inches, and average annual air temperature is about 42 degrees F.

Crowfoot soils are similar to Tomah soils and are near Elbeth soils, Pring soils, and Tomah soils. Tomah soils have a B2t horizon in which the clay is accumulating in discontinuous lamellae. Elbeth soils have a light colored A horizon. Pring soils do not have an A2 horizon or a B horizon and are moderately coarse textured.

Typical pedon of a Crowfoot loamy sand in an area of Tomah-Crowfoot loamy sands, 3 to 8 percent slopes, near the northwest corner of intersection of Highways 83 and 50 in the southwest quarter of sec. 10, T. 11 S., R. 66 W.:

A1—0 to 12 inches; grayish brown (10YR 5/2) loamy sand, very dark grayish brown (10YR 3/2) moist; weak fine granular structure; soft, very friable; neutral; clear smooth boundary.

A2—12 to 23 inches; very pale brown (10YR 7/3) sand, pale brown (10YR 6/3) moist; single grained; loose; few dark brown streaks; slightly acid; gradual wavy boundary.

B2t—23 to 36 inches; light yellowish brown (10YR 6/4) sandy clay loam, yellowish brown (10YR 5/4) moist; moderate medium subangular blocky structure; extremely hard, firm, slightly sticky and slightly plastic; moderate continuous clay films on faces of peds and in root channels; slightly acid; clear wavy boundary.

C—36 to 68 inches; very pale brown (10YR 8/3) coarse sand, pale brown (10YR 6/3) moist; single grained; loose; about 20 percent is B2t material, in bands and in root channels, that is coarse sandy loam and has weak coarse subangular blocky structure.

The solum ranges from 30 to 50 inches in thickness. It is 0 to 15 percent coarse fragments. It is slightly acid or neutral. The A1 horizon is grayish brown or brown loamy sand or light sandy loam. The B2t horizon is light yellowish brown or pale brown coarse sandy clay loam. The C horizon is light gray or very pale brown.

Cruckton series

The Cruckton series consists of deep, well drained soils that formed in arkosic sandy loam deposits. These soils are on uplands. They have slopes of 1 to 9 percent. Average annual precipitation is about 17 inches, and average annual air temperature is about 43 degrees F.

Cruckton soils are similar to Truckton soils and are near Pring and Peyton soils. Truckton soils have a mean annual soil temperature of more than 47 degrees F. Peyton soils have a B2t horizon that is more than 18 percent clay. Pring soils do not have a B2t horizon.

Typical pedon of Cruckton sandy loam, 1 to 9 percent slopes, about 100 feet east and 50 feet south of the intersection of State Highway 83 and Hogdon Road in the northeast corner of sec. 27, T. 11 S., R. 66 W.:

A1—0 to 4 inches; dark grayish brown (10YR 4/2) light sandy loam, very dark grayish brown (10YR 3/2) moist; moderate fine granular structure; soft, very friable; neutral; clear smooth boundary.

B1—4 to 11 inches; dark grayish brown (10YR 4/2) sandy loam, very dark grayish brown (10YR 3/2) moist; weak coarse prismatic structure parting to moderate medium subangular blocky; slightly hard, very friable; neutral; clear smooth boundary.

B2t—11 to 21 inches; grayish brown (10YR 5/2) sandy loam, dark grayish brown (10YR 4/2) moist; moderate coarse prismatic structure parting to moderate medium subangular blocky; very hard, friable, slightly sticky; thin patchy clay films on faces of peds and in root channels and pores; neutral; gradual smooth boundary.

B3—21 to 28 inches; brown (10YR 5/3) light sandy loam, dark brown (10YR 4/3) moist; weak coarse prismatic structure parting to weak fine and medium subangular blocky; hard, very friable; neutral; gradual smooth boundary.

C—28 to 60 inches; pale brown (10YR 6/3) loamy coarse sand, brown (10YR 4/3) moist; massive; slightly hard, very friable; neutral.

The solum ranges from 24 to 38 inches in thickness. It is 0 to 15 percent coarse fragments. It is slightly acid or neutral. The A1 horizon is dark grayish brown or grayish brown sandy loam or loamy sand. The B2t horizon is grayish brown or light brownish gray. The C horizon is pale brown or very pale brown.

Cushman series

The Cushman series consists of moderately deep, well drained soils that formed in calcareous loamy materials derived from weakly consolidated beds of mixed mineralogy. These soils are on uplands. They have slopes of 1 to 15 percent. Average annual precipitation is about 15 inches, and average annual air temperature is about 47 degrees F.

Cushman soils are similar to Fort Collins, Olney, and Stoneham soils. They are near Midway and Razor soils. Fort Collins, Olney, and Stoneham soils do not have bedrock above a depth of 40 inches. Midway and Razor soils do not have a B2t horizon.

Typical pedon of a Cushman loam in an area of Cushman-Kutch complex, 3 to 12 percent slopes, about 525 feet south and 800 feet east of the northwest corner of sec. 35, T. 11 S., R. 62 W.:

A1—0 to 5 inches; grayish brown (10YR 5/2) loam, dark grayish brown (10YR 4/2) moist; moderate fine granular structure; slightly hard, very friable, slightly sticky and slightly plastic; neutral; clear smooth boundary.

B2t—5 to 17 inches; brown (10YR 5/3) sandy clay loam, dark brown (10YR 4/3) moist; moderate medium prismatic structure parting to strong medium and fine subangular blocky; extremely hard, very firm, sticky and plastic; neutral; clear smooth boundary.

B3ca—17 to 23 inches; grayish brown (10YR 5/2) sandy clay loam, dark grayish brown (10YR 4/2) moist; weak medium prismatic structure parting to weak medium subangular blocky; very hard, firm, slightly sticky; visible calcium carbonate in streaks and soft masses; calcareous; mildly alkaline; clear smooth boundary.

C1ca—23 to 30 inches; grayish brown (2.5Y 5/2) fine sandy loam, dark grayish brown (2.5Y 4/2) moist; massive; hard, friable; visible calcium carbonate in streaks and soft masses; calcareous; mildly alkaline; clear smooth boundary.

C2r—30 inches; interbedded shale and weathered sandstone.

The solum ranges from 15 to 32 inches in thickness. It ranges from neutral to moderately alkaline. The A1 horizon is grayish brown or brown. The B2t horizon is grayish brown or brown sandy clay loam or clay loam. The C horizon is grayish brown or light brownish gray.

Elbeth series

The Elbeth series consists of deep, well drained soils that formed in material transported from arkose deposits. These soils are on uplands. They have slopes of 3 to 15

percent. Average annual precipitation is about 18 inches, and average annual air temperature is about 43 degrees F.

Elbeth soils are similar to Coldcreek, Fortwingate, and Tecolote soils and are near Kettle, Crowfoot, Pring, and Tomah soils. Coldcreek and Tecolote soils have a B2t horizon that is more than 35 percent coarse fragments. Coldcreek soils have bedrock at a depth of 20 to 40 inches. Fortwingate soils have a B2t horizon that is more than 35 percent clay and has hue of 5YR to 10R. Crowfoot, Pring, and Tomah soils have a mollic epipedon. Tomah and Kettle soils have a B2t horizon in which clay has accumulated as lamellae.

Typical pedon of Elbeth sandy loam, 8 to 15 percent slopes (fig. 9), at the southeast corner of the intersection of Frank Road and Swan Road in the NE1/4NE1/4 of sec. 9, T. 12 S., R. 65 W.:

A1—0 to 3 inches; very dark grayish brown (10YR 3/2) sandy loam, black (10YR 2/1) moist; moderate fine granular structure; soft, very friable; slightly acid; clear smooth boundary.

A2—3 to 23 inches; light gray (10YR 7/2) loamy sand, grayish brown (10YR 5/2) moist; weak medium subangular blocky structure; soft, very friable; slightly acid; clear wavy boundary.

B21t—23 to 32 inches; brown (7.5YR 5/4) sandy clay loam, dark brown (7.5YR 4/4) moist; moderate medium prismatic structure parting to moderate medium subangular blocky; extremely hard, firm, sticky and plastic; thin coatings of A2 material on faces of peds; continuous clay films on faces of peds; slightly acid; clear smooth boundary.

B22t—32 to 52 inches; brown (7.5YR 5/4) sandy clay loam, dark brown (7.5YR 4/4) moist; moderate medium prismatic structure parting to moderate medium subangular blocky; very hard, firm, sticky and plastic; continuous clay films on faces of peds; neutral; gradual smooth boundary.

B3—52 to 68 inches; reddish yellow (7.5YR 6/6) sandy clay loam, strong brown (7.5YR 5/6) moist; weak coarse prismatic structure parting to moderate medium subangular blocky; very hard, firm, slightly sticky and slightly plastic; thin patchy clay films on faces of peds; neutral; gradual smooth boundary.

C—68 to 74 inches; light yellowish brown (10YR 6/4) sandy clay loam, yellowish brown (10YR 5/4) moist; massive; hard, friable, slightly sticky; neutral.

The solum ranges from 24 to 60 inches in thickness. It is 0 to 15 percent coarse fragments. It ranges from strongly acid to neutral. The A1 horizon is very dark grayish brown or dark grayish brown. The A2 horizon is loamy sand or sand. The B2t horizon is brown or yellowish brown. The C horizon is light yellowish brown or pale brown.

Ellicott series

The Ellicott series consists of deep, somewhat excessively drained soils that formed in noncalcareous stratified sandy alluvium derived from arkose beds of granite. These soils are on terraces and flood plains. They have slopes of 0 to 5 percent. Average annual precipitation is about 14 inches, and average annual air temperature is about 48 degrees F.

Ellicott soils are similar to Ustic Torrifluvents, loamy, and are near Blakeland and Wigton soils. Ustic Torrifluvents, loamy, have stratified layers containing a higher percentage of clay and have a darker surface layer than Ellicott soils. Blakeland soils have a dark colored surface layer and are not stratified. Wigton soils are not stratified.

Typical pedon of Ellicott loamy coarse sand, 0 to 5 percent slopes, about 300 feet west and 1,650 feet south of the northeast corner of the NW1/4 of sec. 16, T. 14 S., R. 62 W.:

A1—0 to 4 inches; grayish brown (10YR 5/2) loamy coarse sand, dark grayish brown (10YR 4/2) moist; single grained; loose; 10 percent fine gravel; neutral; clear smooth boundary.

C—4 to 60 inches; light brownish gray (10YR 6/2) coarse sand stratified with layers of loamy sand, loamy coarse sand, and coarse sandy loam, dark grayish brown (10YR 4/2) moist; single grained; loose; 15 percent fine gravel; neutral.

The solum ranges from 2 to 8 inches in thickness. It is 0 to 35 percent coarse fragments. It ranges from slightly acid to mildly alkaline. The A1 horizon is grayish brown or brown loamy coarse sand or coarse sand. The C horizon is light brownish gray or pale brown.

Fort Collins series

The Fort Collins series consists of deep, well drained soils that formed in medium textured alluvium. These soils are on terraces and uplands. They have slopes of 0 to 8 percent. Average annual precipitation is about 13 inches, and average annual air temperature is about 49 degrees F.

Fort Collins soils are similar to Cushman, Olney, and Stoneham soils and are near the competing Olney and Stoneham soils. The Cushman soils have a paralithic contact at a depth of 20 to 40 inches. Olney soils have more than 35 percent fine or coarser sand in the B2t and C horizons. Stoneham soils are less than 15 inches deep to the base of any B3ca horizon.

Typical pedon of Fort Collins loam, 0 to 3 percent slopes, about 0.45 mile south and 400 feet east of the northwest corner of sec. 19, T. 17 S., R. 63 W.:

A1—0 to 6 inches; brown (10YR 5/3) loam, dark grayish brown (10YR 4/2) moist; moderate fine granular structure; soft, very friable; neutral; clear smooth boundary.

B1—6 to 9 inches; brown (10YR 5/3) loam, dark grayish brown (10YR 4/2) moist; weak medium subangular blocky structure; slightly hard, very friable; few thin patchy clay films on faces of peds; mildly alkaline; clear smooth boundary.

B2t—9 to 16 inches; brown (10YR 5/3) clay loam, dark brown (10YR 4/3) moist; moderate medium prismatic structure parting to moderate medium subangular blocky; hard, friable, sticky; thin continuous clay films on faces of peds; few fine pebbles; mildly alkaline; clear smooth boundary.

B3ca—16 to 21 inches; brown (10YR 5/3) light clay loam, grayish brown (10YR 5/2) moist; weak coarse prismatic structure parting to weak medium subangular blocky; hard, friable, slightly sticky; some visible calcium carbonate occurring as soft masses; calcareous; mildly alkaline; gradual smooth boundary.

C1ca—21 to 29 inches; pale brown (10YR 6/3) loam, brown (10YR 5/3) moist; weak coarse prismatic structure parting to weak medium and coarse subangular blocky; slightly hard, very friable; visible calcium carbonate occurring as soft masses and in thin seams and streaks; calcareous; moderately alkaline; diffuse smooth boundary.

C2ca—29 to 60 inches; pale brown (10YR 6/3) loam, brown (10YR 5/3) moist; massive; soft, very friable; contains less visible calcium carbonate than the above horizon; calcareous; moderately alkaline.

The solum ranges from 15 to 30 inches in thickness. Its content of coarse fragments ranges from 0 to 15 percent but commonly is less than 5 percent. It is neutral or mildly alkaline. The A1 horizon is grayish brown or brown loam or fine sandy loam. The B2t horizon is brown or

pale brown loam to clay loam. The C horizon is pale brown or brown. It is mildly alkaline or moderately alkaline.

Fortwingate series

The Fortwingate series consists of moderately deep, well drained soils that formed in residuum derived from interbedded sandstone and shale. These soils are on mountains. They have slopes of 15 to 40 percent. Average annual precipitation is about 17 inches, and average annual air temperature is about 44 degrees F.

Fortwingate soils are similar to Coldcreek and Tecolote soils and are near Connerton, Paunsaugunt, and Rednun soils. Coldcreek and Tecolote soils have more than 35 percent coarse fragments in the control section. Tecolote soils are more than 40 inches deep to bedrock. Connerton soils are deep, have less than 35 percent clay in the B2t horizon, and are subject to a warmer climate. Paunsaugunt soils are 10 to 20 inches deep over hard limestone bedrock and have hue of 10YR. Rednun soils are more than 40 inches deep over bedrock.

Typical pedon of a Fortwingate loam in an area of Fortwingate-Rock outcrop complex, 15 to 60 percent slopes, along Rampart Range Road, in the SE1/4SE1/4NW1/4 of sec. 33, T. 13 S., R. 67 W.:

A1—0 to 6 inches; reddish brown (5YR 5/3) loam, dark reddish brown (5YR 3/3) moist; moderate fine granular structure; soft, very friable, slightly sticky; 10 percent fine gravel; neutral; clear smooth boundary.

B2t—6 to 23 inches; red (2.5YR 4/6) clay, dark red (2.5YR 3/6) moist; strong medium and coarse prismatic structure parting to strong fine and medium subangular blocky; extremely hard, very firm, sticky and plastic; neutral; clear smooth boundary.

Cr—23 to 38 inches; red (10R 4/6) partially weathered sandstone and shale, dark red (10R 3/6) moist; massive; extremely hard, very firm; mildly alkaline; gradual smooth boundary.

R—38 inches; hard interbedded sandstone and shale.

The solum ranges from 20 to 38 inches in thickness. It is 0 to 15 percent coarse fragments. It is slightly acid or neutral. The A1 horizon is reddish gray or reddish brown loam or light clay loam. The B2t horizon is red or reddish brown. The Cr horizon is red or reddish brown. It is neutral or mildly alkaline.

Heldt series

The Heldt series consists of deep, moderately well drained soils that formed in fine textured alluvial fan sediment derived from clay shale. These soils are on terraces, alluvial fans, and sides of valleys. They have slopes of 0 to 3 percent. Average annual precipitation is about 13 inches, and average annual air temperature is about 49 degrees F.

Heldt soils are similar to Limon and Razor soils and are near Midway and Manzanola soils and the competing Limon soils. Limon soils do not have a B2 horizon. Razor soils are 20 to 40 inches deep over shale bedrock. Midway soils do not have a B2 horizon and have shale bedrock at a depth of 10 to 20 inches. Manzanola soils have a B2t horizon and are deep.

Typical pedon of Heldt clay loam, 0 to 3 percent slopes, about 200 feet east and 400 feet north of the southwest corner of the SE1/4 of sec. 15, T. 16 S., R. 65 W.:

Ap—0 to 5 inches; light brownish gray (2.5Y 6/2) clay loam, dark grayish brown (2.5Y 4/2) moist; weak and moderate thin platy structure parting to moderate fine granular; hard, friable, sticky and plastic; calcareous; moderately alkaline; clear smooth boundary.

B1—5 to 8 inches; light brownish gray (2.5Y 6/2) heavy clay loam, dark grayish brown (2.5Y 4/2) moist; moderate medium and fine angular blocky structure; hard, friable, sticky and plastic; moderately alkaline; gradual smooth boundary.

B2—8 to 23 inches; light brownish gray (2.5Y 6/2) silty clay, dark grayish brown (2.5Y 4/2) moist; moderate medium prismatic structure parting to moderate medium angular blocky; extremely hard, firm, very sticky and very plastic; common shiny pressure faces; calcareous; strongly alkaline; gradual smooth boundary.

B3ca—23 to 41 inches; light brownish gray (2.5Y 6/2) silty clay, dark grayish brown (2.5Y 4/2) moist; weak coarse angular blocky structure; extremely hard, friable, sticky and plastic; few shiny pressure faces; few calcium sulfate crystals; few soft masses of calcium carbonate; calcareous; strongly alkaline; gradual smooth boundary.

Cca—41 to 60 inches; light olive gray (5Y 6/2) silty clay loam, olive gray (5Y 4/2) moist; weak medium subangular blocky structure; very hard, friable, sticky and plastic; some visible calcium carbonate in streaks and soft masses; few crystals of calcium sulfate; calcareous; strongly alkaline.

The solum ranges from 20 to 50 inches in thickness. Its content of coarse fragments ranges from 0 to 15 percent but is commonly less than 5 percent. It is moderately alkaline or strongly alkaline. The A1 horizon is light brownish gray or grayish brown clay loam or silty clay loam. The B2 horizon is light brownish gray or grayish brown. The C horizon is light olive gray or olive gray.

Holderness series

The Holderness series consists of deep, well drained soils that formed in loamy sediment derived from arkosic beds. These soils are on uplands. They have slopes of 1 to 15 percent. Average annual precipitation is about 18 inches, and average annual air temperature is about 43 degrees F.

Holderness soils are similar to Kutch soils and are near Peyton soils. Kutch soils have shale bedrock at a depth of 20 to 40 inches and are in a warmer climate. Peyton soils have a fine-loamy control section.

Typical pedon of Holderness loam, 5 to 8 percent slopes, about 650 feet south of the northwest corner of sec. 16, T. 11 S., R. 64 W.:

A1—0 to 9 inches; grayish brown (10YR 5/2) loam, very dark brown (10YR 2/2) moist; moderate fine granular structure; soft, very friable, neutral; clear smooth boundary.

B21t—9 to 25 inches; brown (10YR 5/3) heavy clay loam, dark brown (10YR 4/3) moist; moderate medium prismatic structure parting to moderate and strong fine subangular blocky; hard, firm, sticky and plastic; thin continuous clay films on faces of peds; neutral; gradual smooth boundary.

B22t—25 to 43 inches; brown (10YR 5/3) heavy clay loam, dark brown (10YR 4/3) moist; moderate coarse prismatic structure parting to moderate medium subangular blocky; hard, friable, sticky and plastic; thin continuous clay films on faces of peds; neutral; clear smooth boundary.

C—43 to 60 inches; light brownish gray (2.5Y 6/2) gravelly sandy clay loam, grayish brown (2.5Y 5/2) moist; massive; extremely hard, friable; 15 percent gravel; mildly alkaline.

The solum ranges from 24 to 50 inches in thickness. It is 0 to 20 percent coarse fragments. It is neutral or mildly alkaline. The A1 horizon is grayish brown or dark grayish brown. The B2t horizon is brown heavy clay loam or clay. The C horizon is light brownish gray or grayish brown.

Jarre series

The Jarre series consists of deep, well drained soils that formed in alluvium derived from sandy sediment. These soils are on alluvial fans or old terraces. They have slopes of 1 to 30 percent. Average annual precipitation is about 18 inches, and average annual air temperature is about 43 degrees F.

Jarre soils are similar to Perrypark and Peyton soils. They are near Pring and the competing Peyton soils. Perrypark and Peyton soils have less than 35 percent fine or coarser sand in the B2t horizon and have less than 35 percent rock fragments in the C horizon. Perrypark soils have hue of 5YR to 10R. Pring soils have less than 18 percent clay in the B2t horizon.

Typical pedon of Jarre gravelly sandy loam, 1 to 8 percent slopes, about 300 feet south and 1,300 feet west of the northeast corner of sec. 23, T. 12 S., R. 67 W.:

A1—0 to 5 inches; dark grayish brown (10YR 4/2) gravelly sandy loam, very dark grayish brown (10YR 3/2) moist; moderate medium granular structure; slightly hard, very friable; 15 percent granitic gravel; neutral; clear smooth boundary.

B21t—5 to 15 inches; brown (7.5YR 4/2) gravelly sandy clay loam, dark brown (7.5YR 3/2) moist; moderate medium subangular blocky structure; hard, very friable, slightly sticky and slightly plastic; 15 percent gravel; neutral; clear smooth boundary.

B22t—15 to 22 inches; brown (7.5YR 5/4) gravelly sandy clay loam, dark brown (7.5YR 4/4) moist; moderate medium prismatic structure parting to moderate medium subangular blocky; very hard, friable, slightly plastic; 30 percent gravel and a few cobbles; neutral; gradual smooth boundary.

IIC—22 to 60 inches; brown (7.5YR 5/4) very gravelly sandy loam, dark brown (7.5YR 4/4) moist; massive; hard, friable; 50 percent gravel and 10 percent cobbles; neutral.

The solum ranges from 20 to 40 inches in thickness. It is 0 to 35 percent coarse fragments. It ranges from slightly acid to mildly alkaline. The A1 horizon is grayish brown or dark grayish brown gravelly sandy loam or sandy loam. The C horizon is brown or light brownish gray.

Keith series

The Keith series consists of deep, well drained soils that formed in silty eolian material. These soils are on uplands. They have slopes of 0 to 3 percent. Average annual precipitation is about 13 inches, and average annual air temperature is about 49 degrees F.

Keith soils are similar to Satanta soils and are near Fort Collins and Stoneham soils. Satanta and Fort Collins soils are fine-loamy. Stoneham soils have a solum less than 15 inches thick.

Typical pedon of Keith silt loam, 0 to 3 percent slopes, about 365 feet east and 70 feet south of the northwest corner of sec. 4, T. 16 S., R. 64 W.:

A11—0 to 4 inches; brown (10YR 4/3) silt loam, dark brown (10YR 3/3) moist; moderate fine granular structure; soft, very friable; neutral; clear smooth boundary.

A12—4 to 8 inches; brown (10YR 4/3) silt loam, dark brown (10YR 3/3) moist; weak fine subangular blocky structure parting to moderate fine granular; slightly hard, very friable; neutral; clear smooth boundary.

B21t—8 to 13 inches; brown (10YR 4/3) silty clay loam, dark brown (10YR 3/3) moist; moderate medium prismatic structure parting to moderate fine subangular blocky; hard, friable, slightly sticky; thin continuous clay films on faces of peds; neutral; gradual smooth boundary.

B22t—13 to 20 inches; grayish brown (10YR 5/2) silty clay loam, dark grayish brown (10YR 4/2) moist; moderate medium prismatic structure parting to moderate medium subangular blocky; hard, friable, slightly sticky and slightly plastic; thin continuous clay films on faces of peds; neutral; gradual smooth boundary.

B3ca—20 to 30 inches; light brownish gray (10YR 6/2) silty clay loam, grayish brown (10YR 5/2) moist; weak medium subangular blocky structure; hard, friable, slightly sticky; few thin patchy clay films on faces of peds; calcareous; mildly alkaline; gradual smooth boundary.

C1ca—30 to 36 inches; pale brown (10YR 6/3) silt loam, brown (10YR 5/3) moist; weak medium subangular blocky structure; slightly hard, very friable; calcareous; moderately alkaline; gradual smooth boundary.

C2—36 to 60 inches; pale brown (10YR 6/3) silt loam, brown (10YR 5/3) moist; massive; slightly hard, very friable; calcareous; moderately alkaline.

The solum ranges from 16 to 36 inches in thickness. It is neutral or mildly alkaline. The A1 horizon is dark grayish brown or brown silt loam, loam, or very fine sandy loam. The B2t horizon is grayish brown or brown silty clay loam or silt loam. The C horizon is light gray to pale brown.

Kettle series

The Kettle series consists of deep, well drained soils that formed in sandy arkosic deposits. These soils are on fans and uplands. They have slopes of 3 to 40 percent. Average annual precipitation is about 18 inches, and average annual air temperature is about 43 degrees F.

Kettle soils are similar to Elbeth and Kutler soils and are near Tomah and competing Elbeth soils. Elbeth soils have a B2t horizon that is 18 to 35 percent clay. Kutler soils do not have a B2t horizon and have more than 35 percent gravel in the control section. Tomah soils have a mollic epipedon.

Typical pedon of Kettle gravelly loamy sand, 3 to 8 percent slopes (fig. 10), about 1,330 feet east of the northwest corner of sec. 16, T. 11 S., R. 66 W.:

O1—3 inches to 1 inch; undecomposed organic material consisting primarily of needles, twigs, and bark.

O2—1 inch to 0; partially decomposed organic material consisting primarily of needles, twigs, and bark.

A1—0 to 3 inches; gray (10YR 5/1) gravelly loamy sand, very dark gray (10YR 3/1) moist; strong fine and very fine granular structure; soft, very friable; 10 percent fine and very fine angular granite gravel; medium acid; abrupt smooth boundary.

A2—3 to 16 inches; light gray (10YR 7/2) gravelly loamy sand, grayish brown (10YR 5/2) moist; weak platy structure that parts to fine granules; soft, very friable; vesicular; 30 percent fine and very fine angular granite gravel; medium acid; diffuse wavy boundary.

B2t—16 to 40 inches; very pale brown (10YR 7/4) gravelly sandy loam (composite texture); yellowish brown (10YR 5/4) moist; this horizon consists of a matrix of coarse loamy sand in which is embedded lamellae of accumulated silicate clay, generally of coarse sandy loam or sandy clay loam texture; weak medium subangular blocky structure; horizon is hard, very friable; peds are very hard, very friable; nearly continuous clay films on faces of peds in the lamellae; thin

clay films and fillings in some root channels and pores; weak clay bridges between sand grains in some parts of the horizon; 30 percent fine and very fine angular granite gravel; medium acid; diffuse wavy boundary.

C—40 to 60 inches; light yellowish brown (10YR 6/4) extremely gravelly loamy sand; yellowish brown (10YR 5/4) moist; massive; very hard, very friable; 70 percent fine or very fine angular granite gravel; medium acid.

The solum ranges from 20 to 50 inches in thickness. It is 0 to 35 percent coarse fragments. It ranges from slightly acid to strongly acid. The A1 horizon is gray or grayish brown. The C horizon is light yellowish brown or yellowish brown.

Kim series

The Kim series consists of deep, well drained soils that formed in calcareous loamy sediment. These soils are on fans and uplands. They have slopes of 1 to 8 percent. Average annual precipitation is about 13 inches, and average annual air temperature is about 49 degrees F.

Kim soils are similar to Neville soils and are near Wiley, Midway, and Razor soils. Neville soils have hue of 5YR to 10R. Wiley soils have a B2t horizon. Midway soils have more than 35 percent clay in the solum and have a shale substratum at a depth of 10 to 20 inches. Razor soils have a B2 horizon, are more than 35 percent clay, and have a clay substratum at a depth of 20 to 40 inches.

Typical pedon of Kim loam, 1 to 8 percent slopes, about 790 feet north and 110 feet west of the southeast corner of sec. 30, T. 17 S., R. 65 W.:

A1—0 to 4 inches; brown (10YR 5/3) loam, dark brown (10YR 4/3) moist; moderate medium granular structure; slightly hard, very friable; 5 percent gravel; calcareous; mildly alkaline; clear smooth boundary.

AC—4 to 12 inches; very pale brown (10YR 7/3) loam, brown (10YR 5/3) moist; weak medium prismatic structure parting to weak fine and very fine subangular blocky; slightly hard, very friable; 5 percent gravel; few soft lime masses; calcareous; moderately alkaline; clear smooth boundary.

Cca—12 to 60 inches; very pale brown (10YR 7/3) loam, brown (10YR 5/3) moist; massive; hard, very friable; 5 percent gravel; visible soft lime masses; calcareous; moderately alkaline.

The solum ranges from 10 to 14 inches in thickness. It is about 0 to 10 percent coarse fragments. It is mildly alkaline or moderately alkaline. The A1 horizon is brown or grayish brown. The C horizon is pale brown or very pale brown.

Kutch series

The Kutch series consists of moderately deep, well drained soils that formed in calcareous clay over shale. These soils are on uplands. They have slopes of 3 to 20 percent. Average annual precipitation is about 15 inches, and average annual air temperature is about 47 degrees F.

Kutch soils are similar to Nunn soils and are near Bresser, Midway, and Razor soils. Nunn soils do not have bedrock at a depth of less than 40 inches. Bresser soils are deep and have a B2t horizon that is less than 35 percent clay. Midway soils do not have a B2t horizon and have bedrock at a depth of less than 20 inches. Razor soils have a B2 horizon.

Typical pedon of Kutch clay loam, 3 to 5 percent slopes, about 50 feet east of the northwest corner of the NE1/4 of sec. 8, T. 12 S., R. 62 W.:

A1—0 to 5 inches; grayish brown (2.5Y 5/2) clay loam, very dark grayish brown (2.5Y 3/2) moist; moderate fine granular structure; slightly hard, friable, slightly sticky and slightly plastic; neutral; clear smooth boundary.

B1—5 to 10 inches; dark grayish brown (10YR 4/2) heavy clay loam, very dark grayish brown (10YR 3/2) moist; weak medium angular blocky structure; hard, firm, sticky and plastic; few thin glossy patches on faces of peds; neutral; clear smooth boundary.

B21t—10 to 17 inches; brown (10YR 4/3) heavy clay loam, dark brown (10YR 3/3) moist; moderate medium prismatic structure parting to moderate medium subangular blocky; extremely hard, very firm, very sticky and very plastic; few shiny pressure faces; neutral; clear wavy boundary.

B22t—17 to 24 inches; grayish brown (2.5Y 5/2) heavy clay loam, olive gray (5Y 5/2) moist; weak medium prismatic structure parting to weak and moderate medium subangular blocky; very hard, firm, sticky and plastic; thin layer that is high in fine and very fine sand and has shiny pressure faces; calcareous; mildly alkaline; abrupt irregular boundary.

B3—24 to 28 inches; pale olive (5Y 6/3) clay loam, olive (5Y 5/3) moist; weak coarse subangular blocky structure; very hard, firm, sticky and plastic; few visible lime mycelia; calcareous; moderately alkaline; clear smooth boundary.

C1ca—28 to 36 inches; light gray (5Y 7/1) extremely shaly clay loam, gray (5Y 6/1) moist; layer of weathered shale; platy structure; slightly hard, friable; 80 percent shale fragments; visible soft lime masses; calcareous; moderately alkaline; gradual smooth boundary.

C2r—36 inches; hard shale; platy structure; calcareous.

The solum ranges from 15 to 40 inches in thickness. Its content of coarse fragments ranges from 0 to 15 percent but commonly is less than 5 percent. It ranges from neutral to moderately alkaline. The A1 horizon is grayish brown or dark grayish brown clay loam to sandy loam. The B2t horizon is brown or grayish brown heavy clay loam or clay. The C horizon is light gray or gray.

Kutler series

The Kutler series consists of moderately deep, somewhat excessively drained soils that formed in material weathered from granite bedrock. These soils are on mountains. They have slopes of 25 to 65 percent. Average annual precipitation is about 20 inches, and average annual air temperature is about 42 degrees F.

Kutler soils are similar to Paunsaugunt and Pring soils. They are near Broadmoor, Jarre, and Tecolote soils. Paunsaugunt soils have hard limestone bedrock at a depth of 10 to 20 inches. Pring soils are deep, are less than 35 percent coarse fragments, and have a mollic epipedon. Broadmoor soils have A2 and B2 horizons. Jarre soils are deep and have a B2t horizon that is more than 18 percent clay. Tecolote soils are deep, have A2 and B2 horizons, and have cobbles and stones throughout the profile.

Typical pedon of a Kutler very gravelly sandy loam (fig. 11) in an area of Kutler-Broadmoor-Rock outcrop complex, 25 to 90 percent slopes, approximately 0.25 mile northwest of tollgate on Crystal Park Road, in SE1/4 of sec. 8, T. 14 S., R. 67 W.:

A1—0 to 6 inches; brown (10YR 4/3) very gravelly sandy loam, dark brown (10YR 3/3) moist; moderate medium granular structure; slightly hard, very friable, slightly sticky and slightly plastic; 40 percent gravel; neutral; gradual smooth boundary.

AC—6 to 11 inches; brown (7.5YR 4/2) very gravelly sandy loam, dark brown (7.5YR 3/2) moist; weak medium granular structure; slightly hard, very friable; 60 percent gravel; neutral; gradual smooth boundary.

C—11 to 23 inches; brown (7.5YR 5/2) extremely gravelly sandy loam, brown (7.5YR 4/2) moist; massive; soft, very friable; 80 percent gravel; neutral; gradual smooth boundary.

Cr—23 inches; highly weathered granite.

The solum ranges from 7 to 20 inches in thickness. It is 35 to 80 percent coarse fragments. It is slightly acid or neutral. The A1 horizon is dark gray, dark grayish brown, or brown. The C horizon is brown or pale brown. Highly weathered granite is at a depth of 20 to 40 inches.

Limon series

The Limon series consists of deep, well drained soils that formed in calcareous clayey alluvium. These soils are on alluvial fans and flood plains. They have slopes of 0 to 3 percent. Average annual precipitation is about 13 inches, and average annual air temperature is about 49 degrees F.

Limon soils are similar to Louviers, Manvel, Nelson, and Schamber soils. They are near Heldt and Manzanola soils. Louviers soils are noncalcareous and have shale bedrock at a depth of 10 to 20 inches. Manvel soils are deep and are silty. Nelson soils have less than 18 percent clay in the control section and are underlain by weathered sandstone. Schamber soils have more than 50 percent coarse fragments in all parts of the control section. Heldt soils have a B2 horizon. Manzanola soils have a B2t horizon.

Typical pedon of Limon clay, 0 to 3 percent slopes, near the southeast corner of racetrack, in the NE1/4 of sec. 9, T. 17 S., R. 65 W.:

A1—0 to 4 inches; light gray (2.5Y 7/2) clay, grayish brown (2.5Y 5/2) moist; strong thin platy structure parting to strong very fine granular; slightly hard, very friable, very sticky and very plastic; calcareous; mildly alkaline; clear smooth boundary.

AC—4 to 12 inches; light gray (2.5Y 7/2) silty clay, grayish brown (2.5Y 5/2) moist; moderate medium platy structure; hard, friable, very sticky and very plastic; calcareous; moderately alkaline; gradual smooth boundary.

Cca—12 to 60 inches; light gray (2.5Y 7/2) silty clay loam, grayish brown (2.5Y 5/2) moist; weak medium subangular blocky structure; extremely hard, very firm, sticky; few visible soft lime masses and gypsum crystals; calcareous; moderately alkaline.

The solum ranges from 4 to 16 inches in thickness. It is 0 to 10 percent coarse fragments. It ranges from mildly alkaline to strongly alkaline. The A1 horizon is light gray or light brownish gray clay or silty clay. The C horizon is light gray or light brownish gray.

Louviers series

The Louviers series consists of shallow, well drained soils that formed in material derived from noncalcareous shale. These soils are on uplands. They have slopes of 3 to 40 percent. Average annual precipitation is about 15 inches, and average annual temperature is about 47 degrees F.

Louviers soils are similar to Midway soils and are near Bresser, Kutch, and Stapleton soils. Midway soils are calcareous throughout. Bresser soils are deep and have a B2t horizon that is 18 to 35 percent clay. Kutch soils are moderately deep, are calcareous in all or part of the control section, and have a B2t horizon that is more than 35 percent clay. Stapleton soils are deep and have less than 18 percent clay throughout.

Typical profile of Louviers silty clay loam, 3 to 18 percent slopes, about 1,600 feet south and 465 feet east of the northwest corner of sec. 17, T. 11 S., R. 61 W.:

A1—0 to 5 inches; grayish brown (2.5Y 5/2) silty clay loam, olive gray (5Y 4/2) moist; moderate fine granular structure; hard, firm, sticky; neutral; abrupt smooth boundary.

AC—5 to 8 inches; grayish brown (2.5Y 5/2) silty clay, olive gray (5Y 4/2) moist; moderate fine prismatic structure parting to moderate subangular blocky; extremely hard, firm, sticky and plastic; neutral; abrupt smooth boundary.

C1—8 to 14 inches; dark grayish brown (2.5Y 4/2) silty clay loam, dark grayish brown (2.5Y 4/2) moist; massive; extremely hard, firm, sticky and plastic; few crystals of gypsum; neutral; abrupt smooth boundary.

C2r—14 inches; shale; some gypsum crystals.

The solum ranges from 4 to 8 inches in thickness. Its content of coarse fragments ranges from 0 to 15 percent but commonly is less than 5 percent. It is neutral or mildly alkaline. The A1 horizon is grayish brown or olive gray silty clay loam or clay. The C horizon is dark grayish brown or olive brown clay, silty clay, or silty clay loam.

Manvel series

The Manvel series consists of deep, well drained soils that formed in calcareous loamy alluvium derived from limestone. These soils are on fans, valley side slopes, and uplands. They have slopes of 3 to 15 percent. Average annual precipitation is about 13 inches, and average annual temperature is about 49 degrees F.

Manvel soils are similar to Neville and Tassel soils and are near Midway and Penrose soils. Neville soils have hue of 5YR to 10R. Tassel soils have hue of 10YR to 5Y and have a paralithic contact at a depth of 10 to 20 inches. Midway soils have hue of 10YR to 5Y, have more than 35 percent clay in the control section, and have shale at a depth of 6 to 20 inches. Penrose soils have limestone bedrock at a depth of 10 to 20 inches.

Typical pedon of Manvel loam, 3 to 9 percent slopes, 1 mile south of Turkey Creek bridge on Lytle Road, in the SE1/4 of sec. 12, T. 17 S., R. 67 W., on east side of road:

A1—0 to 3 inches; grayish brown (10YR 5/2) loam, very dark grayish brown (10YR 3/2) moist; weak medium granular structure; soft, friable; few limestone chips; calcareous; moderately alkaline; clear smooth boundary.

AC—3 to 14 inches; light brownish gray (10YR 6/2) loam, dark grayish brown (10YR 4/2) moist; weak medium subangular blocky structure; slightly hard, friable; few limestone chips; calcareous; moderately alkaline; gradual smooth boundary.

C—14 to 60 inches; pale brown (10YR 6/3) loam, brown (10YR 5/3) moist; massive; hard, friable, slightly sticky; about 10 percent limestone chips; calcareous; strongly alkaline.

The solum ranges from 6 to 14 inches in thickness. It is about 5 percent coarse fragments. It is moderately alkaline or strongly alkaline. The A1 horizon is light brownish gray or grayish brown loam or silt loam. The C horizon is loam, silt loam, or silty clay loam.

Manzanola series

The Manzanola series consists of deep, well drained soils that formed in calcareous loamy alluvium. These soils are on fans, terraces, and sides of valleys. The have slopes of 0 to 9 percent. Average annual precipitation is about 13 inches, and average annual air temperature is about 49 degrees F.

The Manzanola soils are similar to Stoneham and Cushman soils and are near Nunn and Razor soils. Stoneham soils have a solum less than 15 inches thick and have a B2t horizon that is 18 to 35 percent clay. Cushman soils have interbedded sandstone and shale at a depth of 20 to 40 inches. Nunn soils have a mollic epipedon. Razor soils have a B2 horizon and have shale at a depth of 20 to 40 inches.

Typical pedon of Manzanola clay loam, 1 to 3 percent slopes, about 1,450 feet east and 20 feet north of the southwest corner of sec. 9, T. 16 S., R. 65 W.:

Ap—0 to 6 inches; grayish brown (10YR 5/2) clay loam, very dark grayish brown (10YR 3/2) moist; moderate medium granular structure; hard, firm, slightly sticky and slightly plastic; mildly alkaline; clear smooth boundary.

B21t—6 to 10 inches; brown (10YR 5/3) heavy clay loam, dark grayish brown (2.5Y 4/2) moist; weak medium prismatic structure parting to moderate medium subangular blocky; extremely hard, very firm, very sticky and very plastic; thin patchy clay films on faces of peds; calcareous; moderately alkaline; clear smooth boundary.

B22t—10 to 17 inches; grayish brown (2.5Y 5/2) heavy clay loam, dark grayish brown (2.5Y 4/2) moist; weak medium subangular blocky structure; very hard, very firm, very sticky and very plastic; thin continuous clay films on faces of peds; few indistinct lime threads; calcareous; moderately alkaline; clear smooth boundary.

B3ca—17 to 32 inches; grayish brown (2.5Y 5/2) clay loam, dark grayish brown (2.5Y 4/2) moist; weak medium subangular blocky structure; very hard, very firm, slightly sticky and slightly plastic; thin patchy clay films on faces of peds; visible lime threads; calcareous; moderately alkaline; clear smooth boundary.

C—32 to 60 inches; grayish brown (2.5Y 5/2) clay loam, dark grayish brown (2.5Y 4/2) moist; massive; extremely hard, very firm, sticky and plastic; 5 percent gravel; threads and soft masses of lime; calcareous; moderately alkaline.

The solum ranges from 20 to 36 inches in thickness. It is 0 to 15 percent coarse fragments. It ranges from mildly alkaline to strongly alkaline. The A1 or Ap horizon is grayish brown or light brownish gray. The B2t horizon is brown or grayish brown heavy clay loam or light clay. The C horizon is light brownish gray or grayish brown.

Midway series

The Midway series consists of shallow, well drained soils that formed in residuum derived from calcareous shale. These soils are on uplands. They have slopes of 3 to 50 percent. Average annual precipitation is about 13 inches, and average annual air temperature is about 49 degrees F.

Midway soils are similar to Louviers soils and are near Razor soils. Louviers soils are noncalcareous throughout. Razor soils have a B2 horizon and have shale bedrock at a depth of 20 to 40 inches.

Typical pedon of Midway clay loam, 3 to 25 percent slopes, near the southwest corner of sec. 13, T. 16 S., R. 65 W.:

A1—0 to 4 inches; light yellowish brown (2.5Y 6/4) clay loam, light olive brown (2.5Y 5/4) moist; weak thin platy structure parting to weak fine granular; soft, very friable, sticky and plastic; calcareous; moderately alkaline; clear smooth boundary.

AC—4 to 8 inches; light yellowish brown (2.5Y 6/4) clay, light olive brown (2.5Y 5/4) moist; weak thick platy structure parting to weak fine subangular blocky; soft, very friable, sticky and plastic; calcareous; strongly alkaline; clear smooth boundary.

C1—8 to 13 inches; grayish brown (2.5Y 5/2) clay, light olive brown (2.5Y 5/4) moist; weak thick platy structure; hard, friable, sticky and plastic; 50 percent shale fragments; calcareous; strongly alkaline.

C2r—13 inches; light olive brown (2.5Y 5/4) shale.

Depth to shale is 10 to 20 inches. The solum ranges from 8 to 20 inches in thickness. It is moderately alkaline or strongly alkaline. The A1 horizon is silty clay loam or clay loam. The C horizon is light brownish gray or grayish brown.

Nederland series

The Nederland series consists of deep, well drained soils that formed in cobbly and gravelly alluvium or outwash. These soils are on upland fans and terraces. They have slopes of 9 to 25 percent. Average annual precipitation is about 15 inches, and average annual air temperature is about 47 degrees F.

Nederland soils are similar to Stroupe soils and are near Neville and Chaseville soils. Stroupe soils have a B2t horizon that is more than 35 percent clay and have hard bedrock at a depth of 20 to 40 inches. Neville soils have a control section that is less than 15 percent coarse fragments. Chaseville soils do not have a B2t horizon and have less than 18 percent clay in the control section.

Typical pedon of Nederland cobbly sandy loam, 9 to 25 percent slopes, about 900 feet southwest of Highway 115 on the southwest bank of Rock Creek in sec. 31, T. 15 S., R. 66 W.:

A1—0 to 5 inches; brown (7.5YR 4/2) cobbly sandy loam, dark brown (7.5YR 3/2) moist; moderate fine granular structure; soft, very friable; 5 percent gravel and 15 percent cobbles; slightly acid; clear smooth boundary.

B1—5 to 11 inches; brown (7.5YR 5/2) very cobbly loam, dark brown (7.5YR 3/2) moist; weak fine subangular blocky structure; slightly hard, friable, slightly sticky and slightly plastic; few thin patchy clay films on faces of peds; 15 percent gravel and 25 percent cobbles; neutral; clear smooth boundary.

B2t—11 to 28 inches; reddish brown (5YR 5/4) very cobbly clay loam, reddish brown (5YR 4/4) moist; weak medium prismatic structure parting to moderate fine subangular blocky; hard, firm, sticky and plastic; thin clay films on faces of peds; 55 percent gravel and cobbles; neutral; gradual wavy boundary.

C—28 to 60 inches; reddish brown (5YR 5/4) very cobbly sandy loam, reddish brown (5YR 4/4) moist; massive; hard, friable; 45 percent cobbles and gravel; neutral.

The solum ranges from 17 to 30 inches in thickness. It is 35 to 60 percent coarse fragments. It ranges from slightly acid to mildly alkaline. The A1 horizon is brown or dark brown. The B2t horizon is reddish brown or light reddish brown very cobbly sandy clay loam to very cobbly clay loam. The C horizon is reddish brown or light reddish brown.

Nelson series

The Nelson series consists of moderately deep, well drained soils that formed in moderately coarse textured, calcareous residuum derived from sandstone. These soils are on upland hills and ridges. They have slopes of 3 to 12 percent. Average annual precipitation is about 13 inches, and average annual air temperature is about 49 degrees F.

Nelson soils are similar to Penrose soils and are near Tassel, Midway, Razor, and Wiley soils. Penrose soils have a control section that is 18 to 35 percent clay and have bedrock at a depth of 10 to 20 inches. Tassel soils have weathered interbedded sandstone and shale at a depth of 10 to 20 inches. Midway soils have a control section that is more than 35 percent clay and have shale at a depth of 10 to 20 inches. Razor soils have a B2 horizon that is more than 35 percent clay and have shale at a depth of 20 to 40 inches. Wiley soils have a B2t horizon and are deep.

Typical pedon of a Nelson fine sandy loam in an area of Nelson-Tassel sandy loams, 3 to 18 percent slopes, about 400 feet north and 100 feet west of the southeast corner of sec. 8, T. 15 S., R. 65 W.:

A1—0 to 7 inches; grayish bronw (2.5Y 5/2) fine sandy loam, dark grayish brown (2.5Y 4/2) moist; moderate fine granular structure; slightly hard, very friable; calcareous; mildly alkaline; clear smooth boundary.

C1ca—7 to 26 inches; light brownish gray (2.5Y 6/2) fine sandy loam; grayish brown (2.5Y 5/2) moist; massive; slightly hard, very friable; visible calcium carbonate in the form of streaks and seams; calcareous; moderately alkaline; gradual smooth boundary.

C2r—26 to 60 inches; calcareous weathered sandstone and interbedded shale and loamstone.

The A horizon is grayish brown or light brownish gray. The C horizon is light brownish gray or grayish brown fine sandy loam or sandy loam.

Neville series

The Neville series consists of deep, well drained soils that formed in calcareous loamy alluvium weathered from red-bed sandstone and shale. These soils are on upland terraces and fans. They have slopes of 3 to 30 percent. Average annual precipitation is about 14 inches, and average annual air temperature is about 47 degrees F.

Neville soils are similar to Kim and Nelson soils and are near Rednun, Rizozo, and Satanta soils. Kim soils have hue of 7.5YR to 5Y. Nelson soils have a coarse-loamy control section and have beds of soft sandstone and shale at a depth of 20 to 40 inches. Rednun soils have a B2t horizon that is more than 35 percent clay. Rizozo soils have hard bedrock at a depth of 4 to 20 inches. Satanta soils have a B2t horizon that is 18 to 35 percent clay.

Typical pedon of Neville fine sandy loam, 3 to 9 percent slopes, about 150 feet south of the right angle turn in Lytle Road, in the NE1/4 of sec. 34, T. 16 S., R. 67 W.:

A1—0 to 4 inches; reddish gray (5YR 5/2) fine sandy loam, dark reddish brown (5YR 3/2) moist; strong fine granular structure; soft, very friable; calcareous; moderately alkaline; clear smooth boundary.

AC—4 to 10 inches; reddish brown (5YR 5/3) heavy fine sandy loam, reddish brown (5YR 4/3) moist; weak medium subangular blocky structure; hard, very friable; calcareous; moderately alkaline; gradual smooth boundary.

C—10 to 60 inches; light reddish brown (2.5YR 6/4) loam, reddish brown (2.5YR 5/4) moist; massive; hard, very friable; calcareous; moderately alkaline.

The control section typically is heavy loam or light clay loam. The solum is 0 to 15 percent coarse fragments. It is moderately alkaline or strongly alkaline. The A1 horizon is reddish gray or pinkish gray fine sandy loam or loam. The C horizon is light reddish brown or reddish brown.

Nunn series

The Nunn series consists of deep, well drained soils that formed in mixed alluvium. These soils are on terraces, fans, and uplands. They have slopes of 0 to 3 percent. Average annual precipitation is about 14 inches, and average annual air temperature is about 47 degrees F.

Nunn soils are similar to Rednun and Manzanola soils. They are near Fort Collins and Sampson soils; Ustic Torrifluvents, loamy; and the competing Manzanola soils. Rednun soils have hue of 7.5YR to 10R in the B2t horizon. Manzanola soils have an ochric epipedon. Fort Collins soils have an ochric epipedon and have a B2t horizon that is 18 to 35 percent clay. Sampson soils have a B2t horizon that is 18 to 35 percent clay. Ustic Torrifluvents, loamy, have a stratified control section and do not have a B2t horizon.

Typical pedon of Nunn clay loam, 0 to 3 percent slopes, about 200 feet east of the southwest corner of the NW1/4 of sec. 9, T. 16 S., R. 65 W.:

A1—0 to 12 inches; grayish brown (10YR 5/2) clay loam, very dark grayish brown (10YR 3/2) moist; moderate medium granular structure; slightly hard, friable, slightly sticky and slightly plastic; neutral; abrupt smooth boundary.

B21t—12 to 19 inches; grayish brown (2.5Y 5/2) heavy clay loam, dark grayish brown (2.5Y 4/2) moist; moderate medium prismatic structure parting to moderate medium subangular blocky; very hard, very firm, very sticky and very plastic; thin continuous clay films on faces of peds; mildly alkaline; clear smooth boundary.

B22t—19 to 26 inches; grayish brown (2.5Y 5/2) heavy clay loam, dark grayish brown (2.5Y 4/2) moist; moderate coarse prismatic structure parting to moderate medium subangular blocky; very hard, very firm, very sticky and very plastic; thin continuous clay films on faces of peds; few faint mottles (2.5Y 4/0 and 2.5Y 4/4) moist; mildly alkaline; clear smooth boundary.

B3—26 to 30 inches; grayish brown (2.5Y 5/2) clay loam, dark grayish brown (2.5Y 4/2) moist; weak coarse prismatic structure parting to weak medium subangular blocky; very hard, friable, sticky and plastic; calcareous; moderately alkaline; abrupt wavy boundary.

C1ca—30 to 58 inches; light olive brown (2.5Y 5/4) sandy clay loam, olive brown (2.5Y 4/4) moist; weak medium platy structure; hard, firm, slightly sticky and slightly plastic; visible calcium carbonate in the form of soft masses and streaks; calcareous; moderately alkaline; clear irregular boundary.

C2—58 to 72 inches; light brownish gray (2.5Y 6/2) clay, grayish brown (2.5Y 5/2) moist; massive; very hard, very firm, very sticky and very plastic; calcareous; moderately alkaline.

The solum ranges from 16 to 40 inches in thickness. It is 0 to 15 percent coarse fragments. It ranges from neutral to moderately alkaline. The A1 horizon is grayish brown or dark grayish brown clay loam or loam. The B2t horizon is grayish brown or light brownish gray heavy

clay loam to clay. The C horizon is light brownish gray, light olive brown, or grayish brown. It ranges from mildly alkaline to strongly alkaline.

Olney series

The Olney series consists of deep, well drained soils that formed in calcareous sandy sediment. Olney soils are on uplands. They have slopes of 0 to 5 percent. Average annual precipitation is about 13 inches, and average annual air temperature is about 49 degrees F.

Olney soils are similar to Cushman and Stoneham soils. They are near Ascalon and Vona soils and the competing Stoneham soils. Cushman soils have bedrock at a depth of 20 to 40 inches. Stoneham soils have a solum that is less than 15 inches thick. Ascalon soils have a mollic epipedon. Vona soils have a coarse-loamy control section.

Typical pedon of Olney sandy loam, 0 to 3 percent sloeps, 0.3 mile south and 100 feet east of the northwest corner of sec. 26, T. 17 S., R. 63 W.:

A11—0 to 3 inches; grayish brown (10YR 5/2) light sandy loam, dark grayish brown (10YR 4/2) moist; weak medium granular structure; slightly hard, very friable; neutral; clear smooth boundary.

A12—3 to 6 inches; brown (10YR 5/3) sandy loam, dark brown (10YR 4/3) moist; weak medium granular structure; slightly hard, very friable; neutral; clear smooth boundary.

B1—6 to 9 inches; brown (7.5YR 5/4) light sandy clay loam, dark brown (7.5YR 4/4) moist; weak medium subangular blocky structure; hard, friable, slightly sticky and slightly plastic; few thin patchy clay films on faces of peds; neutral; clear smooth boundary.

B21t—9 to 13 inches; brown (10YR 5/3) sandy clay loam, dark brown (10YR 4/3) moist; weak medium prismatic structure parting to moderate medium subangular blocky; very hard, firm, sticky and plastic; nearly continuous clay films on faces of peds; neutral; clear smooth boundary.

B22t—13 to 21 inches; pale brown (10YR 6/3) sandy clay loam, brown (10YR 5/3) moist; moderate medium prismatic structure parting to moderate coarse subangular blocky; very hard, firm, sticky and plastic; nearly continuous clay films on faces of peds; neutral; gradual smooth boundary.

B3ca—21 to 27 inches; pale brown (10YR 6/3) sandy loam, brown (10YR 5/3) moist; weak coarse subangular blocky structure; hard, friable, slightly sticky; 5 percent fine gravel; few thin patchy clay films on faces of peds; visible calcium carbonate in the form of soft masses; calcareous; mildly alkaline; gradual smooth boundary.

C1ca—27 to 38 inches; very pale brown (10YR 7/3) sandy loam, pale brown (10YR 6/3) moist; massive; slightly hard, very friable; visible calcium carbonate in the form of soft masses and seams; calcareous; moderately alkaline; gradual smooth boundary.

C2ca—38 to 60 inches; very pale brown (10YR 7/3) loamy sand, pale brown (10YR 6/3) moist; massive; slightly hard, very friable; visible calcium carbonate in the form of soft masses and seams, but content is less than that in the above horizon; calcareous; moderately alkaline.

The solum ranges from 15 to 30 inches in thickness. It is 0 to 15 percent coarse fragments. It is neutral or mildly alkaline. The A1 horizon is grayish brown or pale brown sandy loam or loamy sand. The B2t horizon is brown or pale brown sandy clay loam, clay loam, or loam. The C horizon is pale brown or very pale brown. It is mildly alkaline or moderately alkaline.

Paunsaugunt series

The Paunsaugunt series consists of shallow, somewhat excessively drained soils that formed in residuum derived from limestone. These soils are on mountains. They have slopes of 15 to 50 percent. Average annual precipitation is about 17 inches, and average annual air temperature is about 43 degrees F.

Paunsaugunt soils are similar to Penrose and Tolman soils. They are near Fortwingate soils. Penrose soils do not have a mollic epipedon and have warmer soil temperatures. Tolman soils have a B2t horizon and are noncalcareous. Fortwingate soils have hue of 5YR to 10R and have bedrock at a depth of 20 to 40 inches.

Typical pedon of a Paunsaugunt gravelly loam in an area of Paunsaugunt-Rock outcrop complex, 15 to 65 percent slopes, on the north side of Rampart Range Road, about 300 feet south and 300 feet east of the northwest corner of the SE1/4NW1/4 of sec. 28, T. 13 S., R. 67 W.:

A1—0 to 6 inches; very dark grayish brown (10YR 3/2) gravelly loam, very dark brown (10YR 2/2) moist; moderate fine granular structure; soft, very friable; 25 percent limestone gravel; calcareous; mildly alkaline; gradual smooth boundary.

AC—6 to 13 inches; grayish brown (10YR 5/2) very gravelly loam, dark grayish brown (10YR 4/2) moist; moderate medium granular structure; soft, very friable; 40 percent limestone gravel; calcareous; mildly alkaline; gradual smooth boundary.

C—13 to 17 inches; light gray (10YR 7/2) very gravelly loam, grayish brown (10YR 5/2) moist; massive; slightly hard, very friable, slightly sticky; 40 percent limestone gravel; calcareous; mildly alkaline; abrupt smooth boundary.

R—17 inches; hard limestone bedrock.

The control section is 35 to 50 percent coarse fragments. It is mildly alkaline or moderately alkaline. The A1 horizon is very dark grayish brown or dark grayish brown gravelly loam or very gravelly loam. The C horizon is light gray or light brownish gray.

Penrose series

The Penrose series consists of shallow, well drained soils that formed in calcareous residuum derived from limestone. These soils are on upland slopes and ridges. They have slopes of 3 to 45 percent. Mean annual precipitation is about 13 inches, and mean annual air temperature is about 49 degrees F.

Penrose soils are similar to Paunsaugunt, Rizozo, and Travessilla soils. They are near Manvel soils. Paunsaugunt soils have a mollic epipedon and have colder soil temperatures. Rizozo soils have hue of 5YR to 10R. Travessilla soils are less than 18 percent clay. Manvel soils do not have bedrock at a depth of less than 40 inches.

Typical pedon of a Penrose channery loam in an area of Penrose-Manvel complex, 3 to 45 percent slopes, in the NW1/4SW1/4 of sec. 32, T. 17 S., R. 66 W.:

A1—0 to 4 inches; grayish brown (10YR 5/2) channery loam, dark grayish brown (10YR 4/2) moist; moderate fine granular structure; soft, very friable, slightly sticky and slightly plastic; 15 percent limestone fragments; calcareous; moderately alkaline; clear smooth boundary.

C—4 to 11 inches; light brownish gray (10YR 6/2) channery loam, dark grayish brown (10YR 4/2) moist; weak medium granular structure; slightly hard, very friable, slightly sticky and slightly plastic; 30 percent limestone fragments; calcareous; moderately alkaline; clear smooth boundary.

R—11 inches; hard gray fractured limestone.

The control section is about 0 to 35 percent coarse fragments. It is mildly alkaline or moderately alkaline. The A horizon ranges from about 2 to 8 inches in thickness. The A1 horizon is grayish brown or light brownish gray channery loam to silt loam. The C horizon is light brownish gray or light gray.

Perrypark series

The Perrypark series consists of deep, well drained soils that formed in arkosic alluvium derived from sedimentary and granite bedrock. These soils are on alluvial fans and valley side slopes. They have slopes of 3 to 9 percent. Average annual precipitation is about 17 inches, and average annual air temperature is about 43 degrees F.

Perrypark soils are similar to Jarre and Peyton soils and are near Pring and the competing Jarre soils. Jarre and Peyton soils have a B2t horizon that has hue of 7.5YR to 2.5Y. Pring soils do not have a B2t horizon and are less than 18 percent clay.

Typical pedon of Perrypark gravelly sandy loam, 3 to 9 percent slopes, about 500 feet north and 100 feet east of the center of sec. 8, T. 11 S., R. 67 W.:

A1—0 to 4 inches; very dark grayish brown (10YR 3/2) gravelly sandy loam, very dark brown (10YR 2/2) moist; weak fine granular structure; soft, very friable; 15 percent gravel; slightly acid; gradual smooth boundary.

B1—4 to 10 inches; very dark grayish brown (10YR 3/2) gravelly sandy clay loam, very dark brown (10YR 2/2) moist; weak fine subangular blocky structure; slightly hard, friable, slightly sticky; thin patchy clay films on the faces of peds; 15 percent gravel; slightly acid; clear smooth boundary.

B2t—10 to 40 inches; reddish gray (5YR 5/2) sandy clay loam, dark reddish gray (5YR 4/2) moist; moderate medium prismatic structure parting to weak medium subangular blocky; extremely hard, friable, sticky and plastic; nearly continuous thin clay films on faces of peds; 10 percent gravel; neutral; gradual smooth boundary.

B3—40 to 48 inches; reddish brown (5YR 4/4) light sandy clay loam, dark reddish brown (5YR 3/4) moist; weak and moderate medium subangular blocky structure; extremely hard, friable, sticky and plastic; thin patchy clay films on faces of peds; 10 percent gravel; neutral; gradual smooth boundary.

C—48 to 60 inches; light reddish brown (5YR 6/3) gravelly sandy loam, reddish brown (5YR 5/3) moist; massive; hard, friable, slightly sticky; 30 percent gravel and cobbles; neutral.

The solum ranges from 24 to 50 inches in thickness. It is 0 to 15 percent coarse fragments. It ranges from slightly acid to mildly alkaline. The A1 horizon is very dark grayish brown or brown gravelly sandy loam or coarse sandy loam. The B2t horizon is reddish gray or reddish brown sandy clay loam to coarse sandy loam.

Peyton series

The Peyton series consists of deep, well drained soils that formed in arkosic alluvium and residuum. These soils are on uplands. They have slopes of 1 to 15 percent. Average precipitation is about 17 inches, and average annual air temperature is about 43 degrees F.

Peyton soils are similar to Jarre and Perrypark soils and are near Pring soils. Jarre soils have more than 15 percent rock fragments. Perrypark soils have a B2t horizon that has hue of 5YR to 10R. Pring soils do not have a B2t horizon.

Typical pedon of a Peyton sandy loam in an area of Peyton-Pring complex, 3 to 8 percent slopes, 0.2 mile east of the northwest corner of sec. 21, T. 11 S., R. 65 W.:

A11—0 to 10 inches; grayish brown (10YR 5/2) sandy loam, very dark grayish brown (10YR 3/2) moist; weak and moderate fine granular structure; slightly hard, very friable; slightly acid; clear smooth boundary.

A12—10 to 12 inches; brown (10YR 5/3) sandy loam, dark brown (10YR 3/3) moist; weak coarse subangular blocky structure; very hard, friable; few bleached sand grains on faces of peds; slightly acid; clear smooth boundary.

B2t—12 to 25 inches; pale brown (10YR 6/3) sandy clay loam, brown (10YR 4/3) moist; moderate medium prismatic structure parting to moderate medium subangular blocky; extremely hard, firm, sticky; thin clay films on faces of peds; neutral; gradual smooth boundary.

B3—25 to 35 inches; pale brown (10YR 6/3) sandy loam, brown (10YR 5/3) moist; weak and moderate medium subangular blocky structure; very hard, friable, slightly sticky; few thin patchy clay films on faces of peds; neutral; gradual smooth boundary.

C—35 to 60 inches; pale brown (10YR 6/3) sandy loam, brown (10YR 5/3) moist; weak coarse subangular blocky structure; very hard, friable; mildly alkaline.

The solum ranges from 25 to 42 inches in thickness. It is 0 to 15 percent coarse fragments. It ranges from slightly acid to mildly alkaline. The A1 horizon is grayish brown or brown. The B2t horizon is pale brown or brown sandy clay loam to clay loam. The C horizon is pale brown or very pale brown.

Pring series

The Pring series consists of deep, well drained soils that formed in arkosic sandy sediment. These soils are on valley side slopes and uplands. They have slopes of 3 to 30 percent. Average annual precipitation is about 17 inches, and average annual air temperature is about 43 degrees F.

Pring soils are similar to Kutler and Stapleton soils and are near Elbeth, Peyton, and Tomah soils. Kutler soils have a paralithic contact at a depth of 20 to 40 inches. Stapleton soils have warmer soil temperatures. Elbeth soils have A2 and B2t horizons. Peyton soils have a B2t horizon. Tomah soils have an A2 horizon and a B2t horizon in which clay is accumulating in lamellae and thin bands.

Typical pedon of Pring coarse sandy loam, 8 to 15 percent slopes, about 950 feet south and 300 feet east of the northwest corner of the NW1/4SE1/4 of sec. 17, T. 11 S., R. 63 W.:

A1—0 to 4 inches; dark grayish brown (10YR 4/2) coarse sandy loam, very dark brown (10YR 2/2) moist; moderate fine granular structure; soft, very friable; slightly acid; clear smooth boundary.

AC—4 to 14 inches; dark grayish brown (10YR 4/2) coarse sandy loam, very dark brown (10YR 2/2) moist; weak coarse prismatic structure parting to moderate medium subangular blocky; hard, very friable; neutral; clear smooth boundary.

C—14 to 60 inches; pale brown (10YR 6/3) gravelly sandy loam, brown (10YR 5/3) moist; massive; very hard, very friable; 15 percent fine and medium gravel; neutral.

The solum ranges from 10 to 20 inches in thickness. It is 0 to 15 percent coarse fragments. It is slightly acid or neutral. The A1 horizon is dark grayish brown or very dark grayish brown. The C horizon is pale brown or brown.

Razor series

The Razor series consists of moderately deep, well drained soils that formed in residuum derived from shale. These soils are on uplands. They have slopes of 3 to 15 percent. Mean annual precipitation is about 13 inches, and mean air temperature is about 49 degrees F.

Razor soils are similar to Midway soils and are near Kutch, Schamber, and Terry soils and the similar Midway soils. Midway soils do not have a B2 horizon and have shale bedrock at a depth of less than 20 inches. Kutch soils are darker colored and have a B2t horizon. Schamber soils are sandy and are more than 35 percent coarse fragments. Terry soils have a B2t horizon that is less than 18 percent clay.

Typical pedon of a Razor clay loam in an area of Razor-Midway complex, 3 to 9 percent slopes, about 250 feet south of northeast corner of the NW1/4NE1/4 of sec. 23, T. 11 S., R. 61 W.:

A1—0 to 3 inches; light brownish gray (10YR 6/2) clay loam, dark grayish brown (10YR 4/2) moist; moderate fine granular structure; soft, friable, slightly sticky and slightly plastic; neutral; clear smooth boundary.

B2—3 to 9 inches; grayish brown (10YR 5/2) heavy clay loam, dark grayish brown (10YR 4/2) moist; weak meidum prismatic structure parting to moderate fine and medium subangular blocky; very hard, firm, sticky and plastic; moderately alkaline; gradual smooth boundary.

B3ca—9 to 18 inches; grayish brown (10YR 5/2) clay, dark grayish brown (10YR 4/2) moist; weak coarse prismatic structure parting to weak medium and coarse subangular blocky; very hard, very firm, sticky and plastic; visible lime in the form of large soft masses; calcareous; moderately alkaline; gradual smooth boundary.

C1ca—18 to 31 inches; grayish brown (10YR 5/2) clay, dark grayish brown (10YR 4/2) moist; weak coarse subangular blocky structure; very hard, very firm, sticky and plastic; visible lime occurs as nodules and streaks; calcareous; moderately alkaline; gradual smooth boundary.

C2r—31 to 48 inches; hard calcareous shale.

The solum ranges from 11 to 20 inches in thickness. The A1 horizon is light brownish gray or grayish brown loam or clay loam. The B2 horizon is clay to heavy clay loam. The C1 horizon is grayish brown or light grayish brown. The C2r horizon is calcareous or noncalcareous shale. In places the C2r horizon has crystals of calcium sulphate.

Rednun series

The Rednun series consists of deep, well drained soils that formed in calcareous sediment derived from red beds, sandstone, and shale. They are on alluvial fans, valley side slopes, and uplands. They have slopes of 3 to 9 percent. Average annual precipitation is about 14 inches, and average annual air temperature is about 48 degrees F.

Rednun soils are similar to Nunn soils and are near Neville and Satanta soils. Nunn soils have hue of 7.5YR to 5Y. Neville soils do not have a B2t horizon and are 18 to 35 percent clay. Satanta soils have a B2t horizon that is 18 to 35 percent clay and have hue of 7.5YR to 5Y.

Typical pedon of a Rednun loam in an area of Neville-Rednun complex, 3 to 9 percent slopes, about 1,500 feet north and 300 feet west of the southeast corner of sec. 15, T. 16 S., R. 67 W.:

A1—0 to 6 inches; brown (7.5YR 4/2) loam, dark brown (7.5YR 3/2) moist; medium fine granular structure; soft, very friable; neutral; clear smooth boundary.

B1—6 to 9 inches; brown (7.5YR 4/4) clay loam, dark reddish brown (5YR 3/3) moist; weak moderate subangular blocky structure; slightly hard, very friable, slightly sticky and slightly plastic; mildly alkaline; gradual smooth boundary.

B21t—9 to 14 inches; reddish brown (5YR 5/3) heavy clay loam, dark reddish brown (5YR 3/3) moist; moderate medium prismatic structure parting to moderate fine subangular blocky; hard, friable, slightly sticky and slightly plastic; mildly alkaline; gradual smooth boundary.

B22t—14 to 29 inches; reddish brown (5YR 5/4) heavy clay loam, reddish brown (5YR 4/3) moist; moderate medium prismatic structure parting to moderate medium subangular blocky; very hard, firm, sticky and plastic; mildly alkaline; gradual smooth boundary.

B3—29 to 41 inches; reddish brown (5YR 5/3) sandy clay loam, reddish brown (5YR 4/3) moist; weak medium prismatic structure parting to moderate medium subangular blocky; hard, friable, slightly sticky and slightly plastic; calcareous; moderately alkaline; gradual smooth boundary.

C—41 to 60 inches; reddish brown (5YR 5/3) sandy clay loam, reddish brown (5YR 4/3) moist; weak coarse prismatic structure parting to weak medium subangular blocky; slightly hard, friable; mildly alkaline.

The solum ranges from 26 to 42 inches in thickness. It is 0 to 5 percent coarse fragments. Reaction ranges from neutral to moderately alkaline. The A1 horizon is brown or reddish brown loam or light clay loam. The B2t horizon is heavy clay loam or light clay.

Rizozo series

The Rizozo series consists of shallow, well drained soils that formed in calcareous, medium textured residuum derived from sandstone. These soils are on uplands. They have slopes of 3 to 30 percent. Average annual precipitation is about 14 inches, and average annual air temperature is about 47 degrees F.

Rizozo soils are similar to Tassel and Travessilla soils and are near Neville and Rednun soils. Tassel soils have weathered sandstone beds at a depth of 10 to 20 inches, have hue of 10YR to 2.5Y, and are less than 18 percent clay. Travessilla soils have hue of 7.5YR to 2.5Y. Neville soils are more than 40 inches deep. Rednun soils have a B2t horizon and are 35 to 50 percent clay.

Typical pedon of a Rizozo loam in an area of Rizozo-Neville complex, 3 to 60 percent slopes, in the NW1/4NE1/4 of sec. 27, T. 16 S., R. 67 W.:

A1—0 to 3 inches; reddish brown (2.5YR 4/4) loam, dark reddish brown (2.5YR 3/4) moist; moderate fine granular structure; soft, very friable, slightly plastic; 15 percent chert; calcareous; moderately alkaline; clear smooth boundary.

C—3 to 10 inches; reddish brown (2.5YR 4/4) loam, dark reddish brown (2.5YR 3/4) moist; weak fine angular blocky structure; slightly hard, friable, slightly plastic; 10 percent chert; calcareous; moderately alkaline; gradual wavy boundary.

R—10 inches; hard red sandstone.

The solum ranges from 3 to 6 inches in thickness. It is 0 to 35 percent coarse fragments. It is mildly alkaline or moderately alkaline. The A1 horizon is loam or very fine sandy loam. The C horizon is reddish brown or red. Red sandstone is at a depth of 4 to 20 inches.

Sampson series

The Sampson series consists of deep, well drained soils that formed in alluvium derived from sedimentary rock. These soils are on alluvial bottom lands that are commonly in small, closed basins. The soils have slopes of 0 to 3 percent. Average annual precipitation is about 14 inches, and average annual air temperature is about 48 degrees F.

Sampson soils are similar to Nunn and Bresser soils. They are near Olney soils. Nunn soils have more than 35 percent clay in the B2t horizon. Bresser soils are dark colored to a depth of less than 20 inches and are noncalcareous. Olney soils are light colored.

Typical pedon of Sampson loam, 0 to 3 percent slopes, 450 feet north of head cut in big gully, NE1/4 of sec. 9, T. 15 S., R. 64 W.:

A1—0 to 6 inches; dark grayish brown (10YR 4/2) loam, very dark grayish brown (10YR 3/2) moist; moderate medium granular structure; hard, very friable, slightly sticky and slightly plastic; neutral; clear smooth boundary.

B1—6 to 15 inches; dark grayish brown (10YR 4/2) loam, very dark grayish brown (10YR 3/2) moist; weak medium prismatic structure parting to moderate medium subangular blocky; hard, very friable, slightly sticky and slightly plastic; few thin clay films on faces of peds; neutral; clear smooth boundary.

B21t—15 to 26 inches; dark brown (10YR 4/3) clay loam, dark brown (10YR 3/3) moist; moderate medium prismatic structure parting to strong medium and fine subangular blocky; very hard, friable, sticky and plastic; continuous clay films on faces of peds; mildly alkaline; clear smooth boundary.

B22t—26 to 34 inches; brown (10YR 4/3) clay loam, dark brown (10YR 3/3) moist; moderate medium prismatic structure parting to strong coarse and medium subangular blocky; very hard, friable, sticky and plastic; thin continuous clay films on faces of peds; mildly alkaline; clear smooth boundary.

B3ca—34 to 50 inches; light brownish gray (2.5Y 6/2) sandy clay loam, grayish brown (2.5Y 5/2) moist; weak medium prismatic structure parting to moderate medium subangular blocky; hard, friable, slightly sticky and slightly plastic; few thin patchy clay films on faces of peds; visible calcium carbonate in the form of a few soft masses; calcareous; moderately alkaline; clear smooth boundary.

Cca—50 to 60 inches; light brownish gray (2.5Y 6/2) sandy clay loam, grayish brown (2.5Y 5/2) moist; massive; hard, friable, slightly sticky and slightly plastic; visible calcium carbonate in the form of a few soft masses; calcareous; moderately alkaline.

The solum ranges from 30 to 54 inches in thickness. It is 0 to 15 percent coarse fragments. It ranges from neutral to moderately alkaline. The A1 horizon is sandy loam or loam. The B2t horizon is dark brown, dark grayish brown, or brown sandy clay loam or clay loam. The C horizon is light brownish gray or grayish brown.

Satanta series

The Satanta series consists of deep, well drained soils that formed in loamy eolian material. These soils are on uplands. They have slopes of 0 to 5 percent. Average annual precipitation is about 15 inches, and average annual air temperature is about 47 degrees F.

Satanta soils are similar to Keith, Wiley, and Ascalon soils. They are near Bresser and Rednun soils. Keith soils are fine-silty. Wiley soils are fine-silty and are lighter colored. Ascalon soils have a B2t horizon that averages more than 35 percent fine or coarser sand. Bresser soils are noncalcareous. Rednun soils have a B2t horizon that is 35 to 50 percent clay, and they have hue of 5YR or 2.5YR.

Typical pedon of Satanta loam, 0 to 3 percent slopes, about 600 feet west and 400 feet north of southeast corner of the NE1/4 of sec. 4, T. 16 S., R. 66 W.:

A1—0 to 4 inches; brown (10YR 4/3) loam, dark brown (10YR 3/3) moist; moderate fine granular structure; soft, very friable; neutral; clear smooth boundary.

B1—4 to 9 inches; brown (10YR 4/3) loam, dark brown (10YR 3/3) moist; weak coarse prismatic structure parting to moderate medium subangular blocky; hard, very friable; neutral; clear smooth boundary.

B21t—9 to 16 inches; brown (10YR 4/3) clay loam, dark brown (10YR 3/3) moist; moderate medium and fine prismatic structure parting to strong medium and fine subangular blocky; very hard, friable, slightly sticky and slightly plastic; thin clay films on faces of peds; mildly alkaline; gradual smooth boundary.

B22t—16 to 30 inches; brown (10YR 5/3) clay loam, dark brown (10YR 4/3) moist; moderate medium prismatic structure parting to strong medium subangular blocky; very hard, friable, sticky and plastic; thin nearly continuous clay films on faces of peds; mildly alkaline; gradual smooth boundary.

B3ca—30 to 39 inches; pale brown (10YR 6/3) loam, brown (10YR 4/3) moist; weak coarse prismatic structure parting to weak coarse subangular blocky; hard, very friable; visible calcium carbonate in the form of soft masses; calcareous; moderately alkaline; gradual smooth boundary.

C—39 to 60 inches; pale brown (10YR 6/3) silt loam, brown (10YR 4/3) moist; massive; slightly hard, very friable; calcareous; moderately alkaline.

The solum ranges from 20 to 40 inches in thickness. It ranges from neutral to moderately alkaline. The A1 horizon is brown or dark brown fine sandy loam or loam. The B2t horizon is grayish brown, brown, or dark brown.

Schamber series

The Schamber series consists of deep, well drained soils that formed in material weathered from gravelly alluvium. These soils are on old terrace breaks or remnants. They have slopes of 15 to 50 percent. Average annual precipitation is about 13 inches, and average annual air temperature is about 49 degrees F.

Schamber soils are similar to Chaseville and Nelson soils. They are near Razor and Satanta soils. Chaseville soils have hue of 5YR to 10R and are noncalcareous. Nelson soils have less than 15 percent coarse fragments and have sandstone at a depth of 20 to 40 inches. Razor soils have a B2 horizon that is more than 35 percent clay, and they have shale at a depth of 20 to 40 inches. Satanta soils have a B2t horizon that is 18 to 35 percent clay.

Typical pedon of a Schamber gravelly loam in an area of Schamber-Razor complex, 8 to 50 percent slopes, about 1,000 feet south and 300 feet west of the northeast corner of sec. 36, T. 17 S., R. 64 W.:

A1—0 to 5 inches; grayish brown (10YR 5/2) gravelly loam, dark grayish brown (10YR 4/2) moist; moderate medium granular structure; slightly hard, very friable; 30 percent gravel; neutral; clear smooth boundary.

AC—5 to 14 inches; brown (10YR 5/3) very gravelly loam, dark brown (10YR 4/3) moist; weak coarse prismatic structure parting to weak medium subangular blocky; slightly hard, friable; 40 percent gravel; mildly alkaline; clear wavy boundary.

Cca—14 to 60 inches; light yellowish brown (10YR 6/4) very gravelly sand, yellowish brown (10YR 5/4) moist; single grained; loose, when dry or moist; 60 percent gravel; calcareous; moderately alkaline.

The solum ranges from 5 to 14 inches in thickness. The control section is 35 to 70 percent coarse fragments. Reaction ranges from neutral to moderately alkaline. The A1 horizon is grayish brown or brown gravelly sandy loam or gravelly loam. The C horizon is pale brown or light yellowish brown.

Stapleton series

The Stapleton series consists of deep, well drained soils that formed in sandy alluvium derived from arkosic bedrock. These soils are on uplands. They have slopes of 3 to 20 percent. Average annual precipitation is about 15 inches, and average annual air temperature is about 47 degrees F.

Stapleton soils are similar to Columbine and Pring soils. They are near Bresser and Truckton soils. Columbine soils have more than 35 percent coarse fragments. Pring soils have mean annual soil temperatures of less than 47 degrees F. Bresser soils have a B2t horizon of sandy clay loam. Truckton soils have a B2t horizon of sandy loam.

Typical pedon of Stapleton sandy loam, 3 to 8 percent slopes, about 800 feet north and 300 feet east of the southwest corner of sec. 16, T. 12 S., R. 64 W.:

A1—0 to 11 inches; grayish brown (10YR 5/2) sandy loam, very dark grayish brown (10YR 3/2) moist; moderate fine granular structure; soft, very friable; 5 percent gravel; neutral; clear smooth boundary.

B2—11 to 17 inches; grayish brown (10YR 5/2) gravelly sandy loam, dark grayish brown (10YR 4/2) moist; moderate medium subangular structure; slightly hard, very friable, slightly sticky; 15 percent fine gravel; neutral; gradual smooth boundary.

C1—17 to 26 inches; pale brown (10YR 6/3) gravelly sandy loam, brown (10YR 4/3) moist; massive; very hard, very friable; 15 percent fine gravel; neutral; gradual smooth boundary.

C2—26 to 60 inches; pale brown (10YR 6/3) gravelly loamy sand, brown (10YR 5/3) moist; massive; 30 percent gravel; neutral.

The solum ranges from 12 to 20 inches in thickness. It is 0 to 35 percent coarse fragments. It is slightly acid or neutral. The A1 horizon is grayish brown or dark grayish brown sandy loam or gravelly sandy loam. The B horizon is brown or grayish brown gravelly sandy loam or coarse sandy loam. The C horizon is pale brown or light brownish gray.

Stoneham series

The Stoneham series consists of deep, well drained soils that formed in medium textured, calcareous sediment. These soils are on uplands. They have slopes of 3 to 15 percent. Average annual precipitation is about 14 inches, and average annual air temperature is about 49 degrees F.

Stoneham soils are similar to Fort Collins and Olney soils. They are near the competing Fort Collins soils. Fort Collins and Olney soils have a solum that is more than 15 inches thick.

Typical pedon of Stoneham sandy loam, 3 to 8 percent slopes, 150 feet north of the gasline and road intersection in the SE1/4 of sec. 7, T. 17 S., R. 64 W.:

A1—0 to 4 inches; pale brown (10YR 6/3) sandy loam, brown (10YR 4/3) moist; weak coarse subangular blocky structure parting to weak medium crumb; slightly hard, very friable; neutral; clear smooth boundary.

B2t—4 to 8 inches; pale brown (10YR 6/3) sandy clay loam, brown (10YR 4/3) moist; weak coarse prismatic structure parting to weak medium subangular blocky; hard, friable, slightly sticky; thin patchy clay films on faces of peds; mildly alkaline; clear smooth boundary.

B3ca—8 to 11 inches; pale brown (10YR 6/3) sandy clay loam, brown (10YR 5/3) moist; weak coarse prismatic structure parting to weak medium subangular blocky; slightly hard, very friable; few thin patchy clay films on faces of peds; visible calcium carbonate in the form of soft masses; calcareous; moderately alkaline; gradual smooth boundary.

C1ca—11 to 16 inches; very pale brown (10YR 7/3) loam, pale brown (10YR 6/3) moist; weak coarse prismatic structure parting to weak medium subangular blocky; soft, very friable; visible calcium carbonate in the form of soft masses; calcareous; moderately alkaline; gradual smooth boundary.

C2ca—16 to 60 inches; very pale brown (10YR 7/3) loam, pale brown (10YR 6/3) moist; massive; soft, very friable; visible calcium carbonate in the form of soft masses; calcareous; moderately alkaline.

The solum ranges from 10 to 15 inches in thickness. It is 0 to 15 percent coarse fragments. It ranges from neutral to moderately alkaline. The A1 horizon is light brownish gray or pale brown sandy loam or loam. The B2t horizon is pale brown or brown sandy clay loam to clay loam. The C horizon is very pale brown or pale brown. It is moderately alkaline or strongly alkaline.

Stroupe series

The Stroupe series consists of moderately deep, well drained soils that formed in fine textured residuum derived from sandstone. These soils are on foothills and ridges. They have slopes of 9 to 45 percent. Average annual precipitation is about 15 inches, and average annual air temperature is about 47 degrees F.

Stroupe soils are similar to Nederland soils and are near Neville, Satanta, and Travessilla soils. Nederland soils have a B2t horizon that is 18 to 35 percent clay and have hue of 5YR to 10R. Neville soils do not have a B2t horizon and have less than 15 percent coarse fragments in the control section. Satanta soils have a B2t horizon that is 18 to 35 percent clay. Travessilla soils do not have a B2t horizon; they have sandstone bedrock at a depth of 6 to 20 inches.

Typical pedon of a Stroupe stony loam in an area of Stroupe-Travessilla-Rock outcrop complex, 9 to 90 percent slopes, on the Fort Carson military reservation, west of Lytle Road in the SW1/4NW1/4 of sec. 13, T. 17 S., R. 67 W.:

A1—0 to 8 inches; dark grayish brown (10YR 4/2) stony loam, very dark grayish brown (10YR 3/2) moist; moderate medium granular structure; slightly hard, friable, slightly sticky and slightly plastic; 20 percent stones and cobbles and 15 percent gravel; neutral; gradual smooth boundary.

B2t—8 to 16 inches; brown (7.5YR 5/4) very stony clay loam, dark brown (7.5YR 4/4) moist; moderate coarse and medium subangular blocky structure; hard, friable, sticky and plastic; 35 percent stones and cobbles and 20 percent gravel; continuous clay films on faces of peds; mildly alkaline; gradual smooth boundary.

C—16 to 35 inches; grayish brown (10YR 5/2) very stony clay loam, dark grayish brown (10YR 4/2) moist; weak coarse subangular blocky structure; hard, friable, sticky and plastic; 50 percent gravel and a few shale chips and 20 percent stones; mildly alkaline.
R—35 inches; hard gray sandstone.

The solum ranges from about 10 to 20 inches in thickness. It is 35 to 70 percent coarse fragments. It is neutral or mildly alkaline. The A1 horizon is dark brown or dark grayish brown. The C horizon is grayish brown or brown.

Tassel series

The Tassel series consists of shallow, well drained soils that formed in calcareous residuum derived from sandstone. These soils are on upland hills and ridges. They have slopes of 3 to 18 percent. Average annual precipitation is about 14 inches, and average annual air temperature is about 48 degrees F.

Tassel soils are similar to Rizozo and Travessilla soils and are near Bresser, Nelson, and Truckton soils. Rizozo soils have hue of 5YR to 10R. Travessilla soils have hard sandstone bedrock at a depth of 6 to 20 inches. Bresser soils are deep and have a B2t horizon that is 18 to 35 percent clay. Nelson soils have weathered sandstone bedrock at a depth of 20 to 40 inches. Truckton soils are deep and have a B2t horizon that is less than 18 percent clay.

Typical pedon of Tassel fine sandy loam, 3 to 18 percent slopes, in the SW1/4 of sec. 10, T. 14 S., R. 64 W.:

A1—0 to 4 inches; grayish brown (10YR 5/2) fine sandy loam, dark grayish brown (10YR 4/2) moist; moderate fine granular structure; soft, very friable; calcareous; mildly alkaline; clear smooth boundary.
AC—4 to 7 inches; brown (10YR 5/3) fine sandy loam, dark brown (10YR 4/3) moist; weak medium subangular blocky structure; slightly hard, very friable; calcareous; moderately alkaline; gradual smooth boundary.
C1—7 to 10 inches; pale brown (10YR 6/3) sandy loam, brown (10YR 4/3) moist; massive; slightly hard, very friable; many small sandstone fragments; calcareous; moderately alkaline; gradual smooth boundary.
C2r—10 inches; sandstone.

The solum ranges from 4 to 10 inches in thickness. Depth to bedrock is 10 to 20 inches. The solum is 0 to 10 percent coarse fragments. It is mildly alkaline or moderately alkaline. The A1 horizon is light brownish gray or grayish brown. The C horizon is light brownish gray or pale brown.

Tecolote series

The Tecolote series consists of deep, well drained soils that formed in sediment derived from igneous rock. These soils are on upland terraces and valley side slopes. They have slopes of 20 to 65 percent. Average annual precipitation is about 18 inches, and average annual air temperature is about 43 degrees F.

Tecolote soils are similar to Broadmoor and Coldcreek soils. They are near Jarre and Kettle soils. Broadmoor soils have a B2 horizon. Coldcreek soils have hard bedrock at a depth of 40 to 60 inches. Jarre soils do not have an A2 horizon; they are 0 to 35 percent coarse fragments throughout. Kettle soils are less than 18 percent clay and are 0 to 35 percent coarse fragments in the control section.

Typical pedon of a Tecolote stony loam in an area of Jarre-Tecolote complex, 8 to 65 percent slopes, along the pipeline road in the SW1/4 of sec. 16, T. 12 S., R. 67 W., at the U.S. Air Force Academy:

O1—1 inch to 0; undecomposed organic material consisting mainly of leaves, twigs, needles, and bark.
A1—0 to 3 inches; dark brown (10YR 4/3) very stony loam, very dark grayish brown (10YR 3/2) moist; weak fine granular structure; slightly hard, very friable, slightly sticky and slightly plastic; 25 percent gravel and 40 percent rounded cobbles and stones; slightly acid; clear wavy boundary.
A2—3 to 12 inches; pinkish gray (7.5YR 7/2) very gravelly loamy sand, brown (7.5YR 5/2) moist; weak fine granular structure; soft, very friable; 50 percent gravel and 10 percent rounded cobbles and stones; slightly acid; gradual wavy boundary.
B1—12 to 29 inches; brown (7.5YR 5/4) extremely gravelly sandy loam, dark brown (7.5YR 4/4) moist; weak coarse subangular blocky structure; slightly hard, very friable; 55 percent gravel and 15 percent cobbles and stones; neutral; clear wavy boundary.
B2t—29 to 45 inches; reddish brown (5YR 5/4) extremely gravelly sandy clay loam, reddish brown (5YR 4/4) moist; moderate coarse subangular blocky structure; hard, friable, slightly sticky and slightly plastic; 60 percent gravel and 20 percent rounded cobbles and stones; thin discontinuous waxlike coatings on faces of peds; waxlike coatings on portions of coarse fragments; neutral; gradual irregular boundary.
C—45 to 65 inches; light brown (7.5YR 6/4) extremely gravelly loamy sand, brown (7.5YR 5/4) moist; massive; slightly hard, very friable; 50 percent gravel and 20 percent rounded cobbles and stones; neutral.

The solum ranges from 40 to 60 inches in thickness. It is 35 to 80 percent coarse fragments. It is slightly acid to neutral. The A1 horizon is dark brown or dark grayish brown stony loam or stony fine sandy loam. The B2t horizon is reddish brown or brown extremely gravelly sandy clay loam or stony sandy clay loam. The C horizon is light brown or brown.

Terry series

The Terry series consists of moderately deep, well drained soils that formed in calcareous residuum derived from sandstone. These soils are on uplands. They have slopes of 1 to 20 percent. Average annual precipitation is about 14 inches, and average annual air temperature is about 48 degrees F.

Terry soils are similar to Bijou and Vona soils. They are near Cushman and Razor soils. Bijou and Vona soils do not have a paralithic contact at a depth of less than 40 inches. Cushman soils have a B2t horizon that is 18 to 35 percent clay. Razor soils have a B2 horizon that is more than 35 percent clay and have shale at a depth of 20 to 40 inches.

Typical pedon of a Terry sandy loam in an area of Terry-Razor complex, 3 to 20 percent slopes, about 900 feet south and 1,800 feet west of the northeast corner of sec. 25, T. 11 S., R. 61 W.:

A1—0 to 5 inches; grayish brown (10YR 5/2) sandy loam, very dark grayish brown (10YR 3/2) moist; moderate fine granular structure; soft, very friable; neutral; gradual smooth boundary.
B2t—5 to 8 inches; grayish brown (10YR 5/2) sandy loam, dark grayish brown (10YR 4/2) moist; moderate medium prismatic structure

parting to moderate medium subangular blocky; slightly hard, very friable; thin patchy clay films on faces of peds; mildly alkaline; gradual smooth boundary.

B3—8 to 16 inches; grayish brown (10YR 5/2) sandy loam, dark grayish brown (10YR 4/2) moist; slightly hard, very friable; mildly alkaline; gradual smooth boundary.

C1—16 to 23 inches; light brownish gray (2.5Y 6/2) sandy loam, grayish brown (2.5Y 5/2) moist; massive; slightly hard, very friable; calcareous; moderately alkaline; gradual smooth boundary.

C2r—23 inches; weathered sandstone.

The solum ranges from 15 to 30 inches in thickness. It is 0 to 15 percent coarse fragments. It ranges from neutral to moderately alkaline. The A1 horizon is light brownish gray or grayish brown. The B2t horizon is grayish brown, dark grayish brown, or brown sandy loam or fine sandy loam. The C horizon is light brownish gray, pale brown, or light yellowish brown.

Tolman series

The Tolman series consists of shallow, well drained soils that formed in medium textured residuum derived from acid igneous rock. These soils are on upland hills and ridges in the foothill areas. They have slopes of 9 to 50 percent. Average annual precipitation is about 18 inches, and average annual air temperature is about 42 degrees F.

Tolman soils are similar to Paunsaugunt soils and are near Coldcreek soils. The Paunsaugunt soils do not have a B2t horizon. Coldcreek soils have an A2 horizon and have bedrock at a depth of 40 inches or more.

Typical pedon of a Tolman gravelly sandy loam in an area of Rock outcrop-Coldcreek-Tolman complex, 9 to 90 percent slopes, on a trail above Rock Creek Park, in the SW1/4 of sec. 36, T. 15 S., R. 67 W.:

A1—0 to 4 inches; dark grayish brown (10YR 4/2) gravelly sandy loam, very dark grayish brown (10YR 3/2) moist; moderate fine granular structure; slightly hard, very friable; 25 percent gravel and 5 percent cobbles; neutral; clear smooth boundary.

B2t—4 to 13 inches; brown (7.5YR 4/2) very cobbly sandy clay loam, dark brown (7.5YR 3/2) moist; weak medium subangular blocky structure parting to moderate medium granular; hard, friable, slightly sticky and slightly plastic; few thin clay films on faces of peds; 25 percent gravel and 20 percent cobbles; neutral; abrupt irregular boundary.

R—13 inches; igneous bedrock.

The solum ranges from 10 to 20 inches in thickness. It is 35 to 75 percent coarse fragments. The A1 horizon is grayish brown or dark grayish brown gravelly sandy loam or gravelly loam. The B2t horizon is brown or dark brown very cobbly sandy clay loam or very gravelly clay loam. Acid igneous bedrock is at a depth of 10 to 20 inches.

Tomah series

The Tomah series consists of deep, well drained soils that formed in alluvium or residuum derived from arkose beds. These soils are on upland alluvial fans, hills, and ridges. They have slopes of 3 to 15 percent. Average annual precipitation is about 17 inches, and average annual air temperature is about 42 degrees F.

Tomah soils are similar to Crowfoot soils and are near the competing Crowfoot soils and the Pring soils. Crowfoot soils have a continuous B2t horizon. Pring soils do not have A2 and B2t horizons.

Typical pedon of a Tomah loamy sand in an area of Tomah-Crowfoot loamy sands, 3 to 8 percent slopes, about 1,080 feet south and 500 feet east of the northwest corner of sec. 9, T. 12 S., R. 64 W.:

A1—0 to 10 inches; dark grayish brown (10YR 4/2) loamy sand, dark grayish brown (10YR 3/2) moist; weak medium granular structure; soft, loose; slightly acid; gradual smooth boundary.

A2—10 to 22 inches; very pale brown (10YR 8/3) sand, pale brown (10YR 6/3) moist; single grained; loose; slightly acid; gradual smooth boundary.

B2t—22 to 48 inches; very pale brown (10YR 8/3) coarse sand, very pale brown (10YR 7/3) moist; single grained, thin lamellae of sandy clay loam that has weak fine subangular blocky structure; loose and hard, loose and friable; nonsticky and slightly sticky, nonplastic and slightly plastic; thin nearly continuous clay films on faces of peds; 10 percent fine gravel; slightly acid; gradual smooth boundary.

C—48 to 60 inches; very pale brown (10YR 8/3) coarse sand, very pale brown (10YR 7/3) moist; massive; hard, very friable; 10 percent gravel; neutral.

The solum ranges from 40 to 60 inches in thickness. It is 0 to 35 percent coarse fragments. It ranges from medium acid to neutral. The A1 horizon is dark grayish brown or brown loamy sand or sandy loam. The B2t horizon is pale brown or light yellowish brown. It has bands of coarse sandy loam or coarse sandy clay loam. The material between the bands is loamy coarse sand or coarse sand. The C horizon is very pale brown or pale brown.

Travessilla series

The Travessilla series consists of shallow, well drained soils that formed in residuum derived from sandstone. These soils are on rocky uplands. They have slopes of 8 to 50 percent. Average annual precipitation is about 15 inches, and average annual air temperature is about 47 degrees F.

Travessilla soils are similar to Rizozo soils. They are near Bresser and Blakeland soils. Rizozo soils have hue of 5YR to 10R. Bresser soils are more than 40 inches deep and have a B2t horizon. Blakeland soils are more than 40 inches deep and have a loamy coarse sand or coarse sand control section.

Typical pedon of a Travessilla sandy loam in an area of Travessilla-Rock outcrop complex, 8 to 90 percent slopes, in the NE1/4NW1/4 of sec. 34, T. 13 S., R. 66 W.:

A1—0 to 3 inches; light brownish gray (10YR 6/2) sandy loam, dark grayish brown (10YR 4/2) moist; weak fine granular structure; slightly hard, very friable; 10 percent gravel; neutral; clear smooth boundary.

AC—3 to 7 inches; pale brown (10YR 6/3) sandy loam, brown (10YR 5/3) moist; weak fine subangular blocky structure; hard, friable, slightly sticky and slightly plastic; 10 percent gravel; mildly alkaline; clear smooth boundary.

C—7 to 11 inches; pale brown (10YR 6/3) sandy loam, brown (10YR 5/3) moist; massive; hard, friable, slightly sticky and slightly plastic; 15 percent gravel; mildly alkaline; clear wavy boundary.

R—11 inches; hard arkosic sandstone that is fractured in places.

Depth to bedrock is 6 to 20 inches. The solum ranges from 4 to 8 inches in thickness. It is 0 to 35 percent coarse fragments. It ranges from neutral to moderately alkaline. The profile is calcareous in places. The A1 horizon is light brownish gray or pale brown sandy loam or loam. The C horizon is light brownish gray or pale brown.

Truckton series

The Truckton series consists of deep, well drained soils that formed in alluvium and residuum derived from arkosic sedimentary rock. These soils are on uplands. They have slopes of 0 to 20 percent. Average annual precipitation is about 15 inches, and average annual air temperature is about 47 degrees F.

Truckton soils are similar to Bresser and Bijou soils. They are near Bresser and Blakeland soils. Bresser soils have a B2t horizon that is 18 to 35 percent clay. Bijou soils do not have a mollic epipedon. Blakeland soils do not have a B2t horizon.

Typical pedon of Truckton sandy loam, 0 to 3 percent slopes, near the southeast corner of sec. 8, T. 14 S., R. 63 W.:

A1—0 to 5 inches; grayish brown (10YR 5/2) sandy loam, very dark grayish brown (10YR 3/2) moist; moderate fine and medium granular structure; slightly hard, very friable; neutral; clear smooth boundary.

A3—5 to 8 inches; dark grayish brown (10YR 4/2) sandy loam, very dark brown (10YR 2/2) moist; moderate medium granular structure; hard, very friable; neutral; gradual smooth boundary.

B21t—8 to 13 inches; brown (10YR 5/3) sandy loam, dark brown (10YR 3/3) moist; moderate coarse prismatic structure parting to coarse and medium subangular blocky; hard, very friable; thin patchy clay films on faces of peds and in root channels and pores; clay bridges between sand grains; neutral; gradual smooth boundary.

B22t—13 to 18 inches; brown (10YR 5/3) sandy loam, dark brown (10YR 4/3) moist; moderate coarse prismatic structure parting to coarse subangular and angular blocky; hard, very friable; thin patchy clay films on faces of peds and in root channels and pores; clay bridges between sand grains; neutral; gradual smooth boundary.

B3—18 to 24 inches; brown (10YR 5/3) coarse sandy loam, olive brown (2.5Y 4/3) moist; weak coarse subangular blocky structure; extremely hard, very friable; few thin patchy clay films on faces of some peds and in some root channels and pores; neutral; gradual smooth boundary.

C—24 to 60 inches; light yellowish brown (2.5Y 6/3) coarse sandy loam, light olive brown (2.5Y 5/3) moist; massive; extremely hard, very friable; neutral.

The solum ranges from 16 to 40 inches in thickness. It is 0 to 15 percent coarse fragments. It is neutral or mildly alkaline. The A1 horizon is grayish brown or brown coarse sandy loam or sandy loam. The B2t horizon is coarse sandy loam to loam. The C horizon is light brownish gray, light yellowish brown, or pale brown.

Valent series

The Valent series consists of deep, excessively drained soils that formed in sandy eolian material. These soils are in dunelike areas on uplands. They have slopes of 1 to 20 percent. Average annual precipitation is about 13 inches, and average annual air temperature is about 49 degrees F.

Valent soils are similar to Blakeland and Wigton soils and are near the competing Wigton soils. Blakeland soils have a dark colored surface layer. Wigton soils have a high proportion of medium and coarse sand.

Typical pedon of Valent sand, 9 to 20 percent slopes, 0.2 mile west and 100 feet south of the northeast corner of sec. 7, T. 17 S., R. 62 W.:

A1—0 to 6 inches; light brownish gray (10YR 6/2) sand, dark grayish brown (10YR 4/2) moist; single grained; loose; neutral; clear smooth boundary.

AC—6 to 12 inches; brown (10YR 5/3) sand, dark brown (10YR 4/3) moist; single grained; loose; neutral; clear smooth boundary.

C—12 to 60 inches; pale brown (10YR 6/3) sand, brown (10YR 5/3) moist; single grained; loose; neutral.

The solum ranges from 4 to 13 inches in thickness. It is less than 2 percent coarse fragments. It is neutral or mildly alkaline. The A1 horizon is light brownish gray or grayish brown sand or fine sand. The C horizon is pale brown or light yellowish brown.

Vona series

The Vona series consists of deep, well drained soils that formed in sandy, calcareous eolian material. These soils are on uplands. They have slopes of 1 to 9 percent. Average annual precipitation is about 13 inches, and average annual air temperature is about 49 degrees F.

Vona soils are similar to Bijou and Terry soils. They are near Olney and Wigton soils. Bijou soils are noncalcareous. Terry soils have sandstone bedrock at a depth of 20 to 40 inches. Olney soils have a B2t horizon that is 18 to 35 percent clay. Wigton soils do not have a B2t horizon and are noncalcareous.

Typical pedon of Vona sandy loam, 3 to 9 percent slopes, about 0.2 mile north and 100 feet east of the southwest corner of sec. 4, T. 17 S., R. 63 W.:

A1—0 to 7 inches; brown (10YR 5/3) sandy loam, brown (10YR 4/3) moist; weak medium granular structure; soft, very friable; neutral; clear smooth boundary.

B2t—7 to 12 inches; brown (10YR 5/3) sandy loam, brown (10YR 4/3) moist; moderate coarse prismatic structure parting to weak coarse subangular blocky; hard, very friable, slightly sticky; clay films on faces of peds; neutral, clear smooth boundary.

B3—12 to 15 inches; brown (10YR 5/3) sandy loam, brown (10YR 4/3) moist; weak coarse prismatic structure; slightly hard, very friable, slightly sticky; few patchy clay films on faces of peds; mildly alkaline; clear smooth boundary.

C1—15 to 20 inches; pale brown (10YR 6/3) sandy loam, brown (10YR 5/3) moist; massive; slightly hard, friable; moderately alkaline; calcareous; gradual smooth boundary.

C2ca—20 to 40 inches; very pale brown (10YR 7/3) sandy loam, brown (10YR 5/3) moist; massive; slightly hard, very friable; visible calcium carbonate as lime masses; calcareous; moderately alkaline; diffuse smooth boundary.

C3—40 to 60 inches; light yellowish brown (10YR 6/4) fine sandy loam, yellowish brown (10YR 5/4) moist; massive; soft, very friable; calcareous; moderately alkaline.

The solum ranges from 15 to 30 inches in thickness. It is 0 to 15 percent coarse fragments. It ranges from neutral to moderately alkaline. The A1 horizon is light grayish brown, grayish brown, or brown. The B2t horizon is grayish brown or brown sandy loam or loam. The C horizon is very pale brown, pale brown, or light yellowish brown.

Wigton series

The Wigton series consists of deep, excessively drained soils that formed in noncalcareous, sandy eolian material. These soils are on dunelike uplands. They have slopes of 1 to 8 percent. Mean annual precipitation is about 13 inches, and mean annual air temperature is about 49 degrees F.

Wigton soils are similar to Blakeland and Valent soils. They are near Bijou and Ellicott soils. Blakeland soils have a dark colored surface layer. Valent soils have a predominantly fine and very fine sand profile. Bijou soils have a B2t horizon. Ellicott soils are stratified.

Typical pedon of Wigton loamy sand, 1 to 8 percent slopes, about 1,320 feet east of the southwest corner of sec. 28, T. 14 S., R. 62 W.:

A1—0 to 8 inches; brown (10YR 4/3) loamy sand, dark brown (10YR 3/3) moist; weak fine granular structure; slightly hard, very friable; neutral; gradual smooth boundary.

AC—8 to 19 inches; brown (10YR 5/3) loamy sand, brown (10YR 4/3) moist; weak medium prismatic structure parting to weak fine granular; hard, very friable; neutral; gradual smooth boundary.

C—19 to 60 inches; very pale brown (10YR 7/3) sand, pale brown (10YR 6/3) moist; massive; hard, very friable; neutral.

The solum ranges from 4 to 12 inches in thickness. It is 0 to 15 percent coarse fragments. It is neutral or mildly alkaline. The A1 horizon is dark grayish brown or brown loamy sand or loamy coarse sand. The C horizon is very pale brown or pale brown.

Wiley series

The Wiley series consists of deep, well drained soils that formed in calcareous, silty eolian material. These soils are on uplands. They have slopes of 1 to 9 percent. Average annual precipitation is about 13 inches, and average annual air temperature is about 49 degrees F.

Wiley soils are similar to Keith soils and are near Ascalon and Stoneham soils. Keith soils have a dark colored surface layer. Ascalon soils have a dark colored surface layer and have a B2t horizon that is more than 45 percent sand. Stoneham soils have less silt and more sand in the B2t horizon.

Typical pedon of Wiley silt loam, 3 to 9 percent slopes, about 0.45 mile west and 100 feet north of the southeast corner of sec. 36, T. 15 S., R. 65 W.:

A1—0 to 5 inches; pale brown (10YR 6/3) silt loam, brown (10YR 4/3) moist; weak coarse subangular blocky structure parting to weak medium granular; soft, very friable; calcareous; mildly alkaline; clear smooth boundary.

B2t—5 to 13 inches; very pale brown (10YR 7/3) heavy silt loam, brown (10YR 5/3) moist; weak medium prismatic structure parting to weak and moderate medium subangular blocky; slightly hard, very friable, slightly sticky; thin patchy clay films on faces of peds; calcareous; moderately alkaline; clear smooth boundary.

B3ca—13 to 23 inches; pale brown (10YR 6/3) silt loam, brown (10YR 5/3) moist; weak coarse prismatic structure parting to moderate medium subangular blocky; slightly hard, very friable; few thin patchy clay films on faces of peds; visible soft masses and mycelia of calcium carbonate; calcareous; moderately alkaline; gradual smooth boundary.

Cca—23 to 60 inches; very pale brown (10YR 7/3) silt loam, pale brown (10YR 6/3) moist; very weak coarse prismatic structure; slightly hard, very friable, slightly sticky; visible soft masses and mycelia of calcium carbonate; calcareous; moderately alkaline.

The solum ranges from 15 to 36 inches in thickness. It is mildly alkaline or moderately alkaline. The A1 horizon is pale brown or light brownish gray silt loam or very fine sandy loam. The B2t horizon is very pale brown or light gray silt loam or light silty clay loam. The C horizon is very pale brown or pale brown. It is moderately alkaline or strongly alkaline.

Yoder series

The Yoder series consists of deep, well drained soils that formed in noncalcareous alluvium derived from arkosic deposits. These soils are on uplands. They have slopes of 1 to 25 percent. Average annual precipitation is about 15 inches, and average air temperature is about 47 degrees F.

Yoder soils are similar to Vona soils and are near Bresser and Truckton soils. Vona soils are calcareous, and they have less than 15 percent coarse fragments in the solum. Bresser and Truckton soils have a dark colored surface layer.

Typical pedon of Yoder gravelly sandy loam, 1 to 8 percent slopes, about 50 feet east and 100 feet north of the southwest corner of sec. 36, T. 12 S., R. 62 W.:

A1—0 to 6 inches; grayish brown (10YR 5/2) gravelly sandy loam, very dark grayish brown (10YR 3/2) moist; weak medium granular structure; slightly hard, very friable; 15 percent fine and very fine gravel; slightly acid; clear smooth boundary.

B2t—6 to 12 inches; brown (10YR 5/3) gravelly sandy clay loam, dark brown (10YR 4/3) moist; moderate coarse prismatic structure parting to moderate medium subangular blocky; hard, friable, slightly sticky; thin clay films on faces of peds and on gravel; 30 percent fine and very fine gravel; slightly acid.

IIC—12 to 60 inches; light yellowish brown (10YR 6/4) very gravelly loamy coarse sand, yellowish brown (10YR 5/4) moist; massive; very hard, very friable; 50 percent gravel; neutral.

The solum ranges from 10 to 25 inches in thickness. It is 0 to 35 percent coarse fragments. It is slightly acid or neutral. The A1 horizon is brown or grayish brown gravelly sandy loam or gravelly coarse sandy loam. The B2t horizon is brown or grayish brown gravelly sandy clay loam or sandy clay loam. The IIC horizon light yellowish brown or very pale brown. It is 35 to 70 percent gravel.

Classification of the soils

The system of soil classification currently used was adopted by the National Cooperative Soil Survey in 1965. Readers interested in further details about the system should refer to "Soil taxonomy" (*4*).

The system of classification has six categories. Beginning with the broadest, these categories are the order, suborder, great group, subgroup, family, and series. In this system the classification is based on the different soil properties that can be observed in the field or those that can be inferred either from other properties that are observable in the field or from the combined data of soil science and other disciplines. The properties selected for the higher categories are the result of soil genesis or of factors that affect soil genesis. In table 17, the soils of the survey area are classified according to the system. Categories of the system are discussed in the following paragraphs.

ORDER. Ten soil orders are recognized as classes in the system. The properties used to differentiate among orders are those that reflect the kind and degree of dominant soil-forming processes that have taken place. Each order is identified by a word ending in *sol*. An example is Entisol.

SUBORDER. Each order is divided into suborders based primarily on properties that influence soil genesis and are important to plant growth or that are selected to reflect the most important variables within the orders. The last syllable in the name of a suborder indicates the order. An example is Aquent (*Aqu*, meaning water, plus *ent*, from Entisol).

GREAT GROUP. Each suborder is divided into great groups on the basis of close similarities in kind, arrangement, and degree of expression of pedogenic horizons; soil moisture and temperature regimes; and base status. Each great group is identified by the name of a suborder and a prefix that suggests something about the properties of the soil. An example is Haplaquents (*Hapl*, meaning simple horizons, plus *aquent*, the suborder of Entisols that have an aquic moisture regime).

SUBGROUP. Each great group may be divided into three subgroups: the central (typic) concept of the great groups, which is not necessarily the most extensive subgroup; the intergrades, or transitional forms to other orders, suborders, or great groups; and the extragrades, which have some properties that are representative of the great groups but do not indicate transitions to any other known kind of soil. Each subgroup is identified by one or more adjectives preceeding the name of the great group. The adjective *Typic* identifies the subgroup that is thought to typify the great group. An example is Typic Haplaquents.

FAMILY. Families are established within a subgroup on the basis of similar physical and chemical properties that affect management. Among the properties considered in horizons of major biological activity below plow depth are particle-size distribution, mineral content, temperature regime, thickness of the soil penetrable by roots, consistence, moisture equivalent, soil slope, and permanent cracks. A family name consists of the name of a subgroup and a series of adjectives. The adjectives are the class names for the soil properties used as family differentiae. An example is fine-loamy, mixed, nonacid, mesic, Typic Haplaquents.

SERIES. The series consists of soils that formed in a particular kind of material and have horizons that, except for texture of the surface soil or of the underlying substratum, are similar in differentiating characteristics and in arrangement in the soil profile. Among these characteristics are color, texture, structure, reaction, consistence, and mineral and chemical composition.

References

(1) American Association of State Highway (and Transportation) Officials. 1970. Standard specifications for highway materials and methods of sampling and testing. Ed. 10, 2 vol., illus.

(2) American Society for Testing and Materials. 1974. Methods for classification of soils for engineering purposes. ASTM Stand. D 2487-69. *In* 1974 Annual Book of ASTM Standards, Part 19, 464 pp., illus.

(3) United States Department of Agriculture. 1951. Soil survey manual. U. S. Dep. Agric. Handb. 18, 503 pp., illus. (Supplements replacing pp. 173-188 issued May 1962)

(4) United States Department of Agriculture. 1975. Soil Taxonomy. A basic system of soil classification for making soil surveys. Soil Conserv. Service, U. S. Dep. Agric. Handb. 436, 754 pp., illus.

Glossary

Aggregate, soil. Many fine particles held in a single mass or cluster. Natural soil aggregates, such as granules, blocks, or prisms, are called peds. Clods are aggregates produced by tillage or logging.

Alluvium. Material, such as sand, silt, or clay, deposited on land by streams.

Area reclaim. An area difficult to reclaim after the removal of soil for construction and other uses. Revegetation and erosion control are extremely difficult.

Arkose. A sandstone containing unaltered feldspar and derived from granite or gneiss.

Association, soil. A group of soils geographically associated in a characteristic repeating pattern and defined and delineated as a single mapping unit.

Available water capacity (available moisture capacity). The capacity of soils to hold water available for use by most plants. It is commonly defined as the difference between the amount of soil water at field moisture capacity and the amount at wilting point. It is commonly expressed as inches of water per inch of soil. The capacity, in inches, in a 60-inch profile or to a limiting layer is expressed as—

	Inches
Very low	0 to 3
Low	3 to 6
Moderate	6 to 9
High	More than 9

Badland. Steep or very steep, commonly nonstony barren land dissected by many intermittent drainage channels. Badland is most common in semiarid and arid regions where streams are entrenched in soft geologic material. Local relief generally ranges from 25 to 500 feet. Runoff potential is very high, and geologic erosion is active.

Bedrock. The solid rock that underlies the soil and other unconsolidated material or that is exposed at the surface.

Blowout. A shallow depression from which all or most of the soil material has been removed by wind. A blowout has a flat or irregular floor formed by a resistant layer or by an accumulation of pebbles or cobbles. In some blowouts the water table is exposed.

Boulders. Rock fragments larger than 2 feet (60 centimeters) in diameter.

Calcareous soil. A soil containing enough calcium carbonate (commonly with magnesium carbonate) to effervesce (fizz) visibly when treated with cold, dilute hydrochloric acid. A soil having measurable amounts of calcium carbonate or magnesium carbonate.

Catsteps. Very small, irregular terraces on steep hillsides, especially in pasture, formed by the trampling of cattle or the slippage of saturated soil.

Channery soil. A soil, that is, by volume, more than 15 percent thin, flat fragments of sandstone, shale, slate, limestone, or schist as much as 6 inches along the longest axis. A single piece is called a fragment.

Chiseling. Tillage with an implement having one or more soil-penetrating points that loosen the subsoil and bring clods to the surface. A form of emergency tillage to control soil blowing.

Clay. As a soil separate, the mineral soil particles less than 0.002 millimeter in diameter. As a soil textural class, soil material that is 40 percent or more clay, less than 45 percent sand, and less than 40 percent silt.

Clay film. A thin coating of oriented clay on the surface of a soil aggregate or lining pores or root channels. Synonyms: clay coat, clay skin.

Coarse fragments. Mineral or rock particles up to 3 inches (2 millimeters to 7.5 centimeters) in diameter.

Coarse textured (light textured) soil. Sand or loamy sand.

Cobblestone (or cobble). A rounded or partly rounded fragment of rock 3 to 10 inches (7.5 to 25 centimeters) in diameter.

Complex slope. Irregular or variable slope. Planning or constructing terraces, diversions, and other water-control measures is difficult.

Complex, soil. A mapping unit of two or more kinds of soil occurring in such an intricate pattern that they cannot be shown separately on a soil map at the selected scale of mapping and publication.

Compressible. Excessive decrease in volume of soft soil under load.

Consistence, soil. The feel of the soil and the ease with which a lump can be crushed by the fingers. Terms commonly used to describe consistence are—

Loose.—Noncoherent when dry or moist; does not hold together in a mass.

Friable.—When moist, crushes easily under gentle pressure between thumb and forefinger and can be pressed together into a lump.

Firm.—When moist, crushes under moderate pressure between thumb and forefinger, but resistance is distinctly noticeable.

Plastic.—When wet, readily deformed by moderate pressure but can be pressed into a lump; will form a "wire" when rolled between thumb and forefinger.

Sticky.—When wet, adheres to other material and tends to stretch somewhat and pull apart rather than to pull free from other material.

Hard.—When dry, moderately resistant to pressure; can be broken with difficulty between thumb and forefinger.

Soft.—When dry, breaks into powder or individual grains under very slight pressure.

Cemented.—Hard; little affected by moistening.

Contour stripcropping (or contour farming). Growing crops in strips that follow the contour. Strips of grass or close-growing crops are alternated with strips of clean-tilled crops or summer fallow.

Control section. The part of the soil on which classification is based. The thickness varies among different kinds of soil, but for many it is 40 or 80 inches (1 or 2 meters).

Corrosive. High risk of corrosion to uncoated steel or deterioration of concrete.

Cover crop. A close-growing crop grown primarily to improve and protect the soil between periods of regular crop production, or a crop grown between trees and vines in orchards and vineyards.

Cutbanks cave. Unstable walls of cuts made by earthmoving equipment. The soil sloughs easily.

Deferred grazing. A delay in grazing until range plants have reached a specified stage of growth. Grazing is deferred in order to increase the vigor of forage and to allow desirable plants to produce seed. Contrasts with continuous grazing and rotation grazing.

Depth to rock. Bedrock at a depth that adversely affects the specified use.

Diversion (or diversion terrace). A ridge of earth, generally a terrace, built to protect downslope areas by diverting runoff from its natural course.

Drainage class (natural). Refers to the frequency and duration of periods of saturation or partial saturation during soil formation, as opposed to altered drainage, which is commonly the result of artificial drainage or irrigation but may be caused by the sudden deepening of channels or the blocking of drainage outlets. Seven classes of natural soil drainage are recognized:

Excessively drained.—Water is removed from the soil very rapidly. Excessively drained soils are commonly very coarse textured, rocky, or shallow. Some are steep. All are free of the mottling related to wetness.

Somewhat excessively drained.—Water is removed from the soil rapidly. Many somewhat excessively drained soils are sandy and rapidly pervious. Some are shallow. Some are so steep that much of the water they receive is lost as runoff. All are free of the mottling related to wetness.

Well drained.—Water is removed from the soil readily, but not rapidly. It is available to plants throughout most of the growing season, and wetness does not inhibit growth of roots for significant periods during most growing seasons. Well drained soils are commonly medium textured. They are mainly free of mottling.

Moderately well drained.—Water is removed from the soil somewhat slowly during some periods. Moderately well drained soils are wet for only a short time during the growing season, but periodically for long enough that most mesophytic crops are affected. They commonly have a slowly pervious layer within or directly below the solum, or periodically receive high rainfall, or both.

Somewhat poorly drained.—Water is removed slowly enough that the soil is wet for significant periods during the growing season. Wetness markedly restricts the growth of mesophytic crops unless artificial drainage is provided. Somewhat poorly drained soils commonly have a slowly pervious layer, a high water table, additional water from seepage, nearly continuous rainfall, or a combination of these.

Poorly drained.—Water is removed so slowly that the soil is saturated periodically during the growing season or remains wet for long periods. Free water is commonly at or near the surface for long enough during the growing season that most mesophytic crops cannot be grown unless the soil is artificially drained. The soil is not continuously saturated in layers directly below plow depth. Poor drainage results from a high water table, a slowly pervious layer within the profile, seepage, nearly continuous rainfall, or a combination of these.

Very poorly drained.—Water is removed from the soil so slowly that free water remains at or on the surface during most of the growing season. Unless the soil is artificially drained, most mesophytic crops cannot be grown. Very poorly drained soils are commonly level or depressed and are frequently ponded. Yet, where rainfall is high and nearly continuous, they can have moderate or high slope gradients, as for example in "hillpeats" and "climatic moors."

Drainage, surface. Runoff, or surface flow of water, from an area.

Eolian soil material. Earthy parent material accumulated through wind action; commonly refers to sandy material in dunes or to loess in blankets on the surface.

Erosion. The wearing away of the land surface by running water, wind, ice, or other geologic agents and by such processes as gravitational creep.

Erosion (geologic). Erosion caused by geologic processes acting over long geologic periods and resulting in the wearing away of mountains and the building up of such landscape features as flood plains and coastal plains. Synonym: natural erosion.

Erosion (accelerated). Erosion much more rapid than geologic erosion, mainly as a result of the activities of man or other animals or of a catastrophe in nature, for example, fire, that exposes a bare surface.

Fallow. Cropland left idle in order to restore productivity through accumulation of moisture. Summer fallow is common in regions of limited rainfall where cereal grains are grown. The soil is tilled for at least one growing season for weed control and decomposition of plant residue.

Favorable. Favorable soil features for the specified use.

Fertility, soil. The quality that enables a soil to provide plant nutrients, in adequate amounts and in proper balance, for the growth of specified plants when light, moisture, temperature, tilth, and other growth factors are favorable.

Flagstone. A thin fragment of sandstone, limestone, slate, shale, or (rarely) schist, 6 to 15 inches (15 to 37.5 centimeters) long.

Flooding. The temporary covering of soil with water from overflowing streams, runoff from adjacent slopes, and tides. Frequency, duration, and probable dates of occurrence are estimated. Frequency is expressed as none, rare, occasional, and frequent. *None* means that flooding is not probable; *rare* that it is unlikely but possible under unusual weather conditions; *occasional* that it occurs on an average of once or less in 2 years; and *frequent* that it occurs on an average of more than once in 2 years. Duration is expressed as *very brief* if less than 2 days, *brief* if 2 to 7 days, and *long* if more than 7 days. Probable dates are expressed in months; *November-May*, for example, means that flooding can occur during the period November through May. Water standing for short periods after rainfall or commonly covering swamps and marshes is not considered flooding.

Flood plain. A nearly level alluvial plain that borders a stream and is subject to flooding unless protected artificially.

Forage. Plant material used as feed by domestic animals. Forage can be grazed or cut for hay.

Forb. Any herbaceous plant not a grass or a sedge.

Frost action. Freezing and thawing of soil moisture. Frost action can damage structures and plant roots.

Gleyed soil. A soil having one or more neutral gray horizons as a result of waterlogging and lack of oxygen. The term "gleyed" also designates gray horizons and horizons having yellow and gray mottles as a result of intermittent waterlogging.

Grassed waterway. A natural or constructed waterway, typically broad and shallow, seeded to grass as protection against erosion. Conducts surface water away from cropland.

Gravel. Rounded or angular fragments of rock up to 3 inches (2 millimeters to 7.5 centimeters) in diameter. An individual piece is a pebble.

Gravelly soil material. Material from 15 to 50 percent, by volume, rounded or angular rock fragments, not prominently flattened, up to 3 inches (7.5 centimeters) in diameter.

Gully. A miniature valley with steep sides cut by running water and through which water ordinarily runs only after rainfall. The distinction between a gully and a rill is one of depth. A gully generally is an obstacle to farm machinery and is too deep to be obliterated by ordinary tillage; a rill is of lesser depth and can be smoothed over by ordinary tillage.

Guzzler. A manmade watering facility for wildlife.

Gypsum. Hydrous calcium sulphate.

Habitat. The natural abode of a plant or animal; refers to the kind of environment in which a plant or animal normally lives, as opposed to the range or geographical distribution.

Horizon, soil. A layer of soil, approximately parallel to the surface, having distinct characteristics produced by soil-forming processes. The major horizons of mineral soil are as follows:

O horizon.—An organic layer, fresh and decaying plant residue, at the surface of a mineral soil.

A horizon.—The mineral horizon, formed or forming at or near the surface, in which an accumulation of humified organic matter is mixed with the mineral material. Also, a plowed surface horizon most of which was originally part of a B horizon.

A2 horizon.—A mineral horizon, mainly a residual concentration of sand and silt high in content of resistant minerals as a result of the loss of silicate clay, iron, aluminum, or a combination of these.

B horizon.—The mineral horizon below an A horizon. The B horizon is in part a layer of change from the overlying A to the underlying C horizon. The B horizon also has distinctive characteristics caused (1) by accumulation of clay, sesquioxides, humus, or a combination of these; (2) by prismatic or blocky structure; (3) by redder or browner colors than those in the A horizon; or (4) by a combination of these. The combined A and B horizons are generally called the solum, or true soil. If a soil lacks a B horizon, the A horizon alone is the solum.

C horizon.—The mineral horizon or layer, excluding indurated bedrock, that is little affected by soil-forming processes and does not have the properties typical of the A or B horizon. The material of a C horizon may be either like or unlike that from which the solum is presumed to have formed. If the material is known to differ from that in the solum the Roman numeral II precedes the letter C.

R layer.—Consolidated rock beneath the soil. The rock commonly underlies a C horizon, but can be directly below an A or a B horizon.

Hummocky. Refers to a landscape of hillocks, separated by low sags, having sharply rounded tops and steep sides. Hummocky relief resembles rolling or undulating relief, but the tops of ridges are narrower and the sides are shorter and less even.

Hydrologic soil groups. Refers to soils grouped according to their runoff-producing characteristics. The chief consideration is the inherent capacity of soil bare of vegetation to permit infiltration. The slope and the kind of plant cover are not considered, but are separate factors in predicting runoff. Soils are assigned to four groups. In group A are soils having a high infiltration rate when thoroughly wet and having a low runoff potential. They are mainly deep, well drained, and sandy or gravelly. In group D, at the other extreme, are soils having a very slow infiltration rate and thus a high runoff potential. They have a claypan or clay layer at or near the surface, have a permanent high water table, or are shallow over nearly impervious bedrock or other material. A soil is assigned to two hydrologic groups if part of the acreage is artificially drained and part is undrained.

Infiltration. The downward entry of water into the immediate surface of soil or other material, as contrasted with percolation, which is movement of water through soil layers or material.

Invaders. On range, plants that encroach into an area and grow after the climax vegetation has been reduced by grazing. Generally, invader plants are those that follow disturbance of the surface.

Irrigation. Application of water to soils to assist in production of crops. Methods of irrigation are—

Border.—Water is applied at the upper end of a strip in which the lateral flow of water is controlled by small earth ridges called border dikes, or borders.

Basin.—Water is applied rapidly to nearly level plains surrounded by levees or dikes.

Controlled flooding.—Water is released at intervals from closely spaced field ditches and distributed uniformly over the field.

Corrugation.—Water is applied to small, closely spaced furrows or ditches in fields of close-growing crops or in orchards so that it flows in only one direction.

Furrow.—Water is applied in small ditches made by cultivation implements. Furrows are used for tree and row crops.

Sprinkler.—Water is sprayed over the soil surface through pipes or nozzles from a pressure system.

Subirrigation.—Water is applied in open ditches or tile lines until the water table is raised enough to wet the soil.

Wild flooding.—Water, released at high points, is allowed to flow onto an area without controlled distribution.

Large stones. Rock fragments 10 inches (25 centimeters) or more across. Large stones adversely affect the specified use.

Liquid limit. The moisture content at which the soil passes from a plastic to a liquid state.

Loam. Soil material that is 7 to 27 percent clay particles, 28 to 50 percent silt particles, and less than 52 percent sand particles.

Loess. Fine grained material, dominantly of silt-sized particles, deposited by wind.

Low strength. Inadequate strength for supporting loads.

Medium textured soil. Very fine sandy loam, loam, silt loam, or silt.

Minimum tillage. Only the tillage essential to crop production and prevention of soil damage.

Morphology, soil. The physical makeup of the soil, including the texture, structure, porosity, consistence, color, and other physical, mineral, and biological properties of the various horizons, and the thickness and arrangement of those horizons in the soil profile.

Mottling, soil. Irregular spots of different colors that vary in number and size. Mottling generally indicates poor aeration and impeded drainage. Descriptive terms are as follows: abundance—*few*, *common*, and *many*; size—*fine*, *medium*, and *coarse*; and contrast—*faint*, *distinct*, and *prominent*. The size measurements are of the diameter along the greatest dimension. *Fine* indicates less than 5 millimeters (about 0.2 inch); *medium*, from 5 to 15 millimeters (about 0.2 to 0.6 inch); and *coarse*, more than 15 millimeters (about 0.6 inch).

Muck. Dark colored, finely divided, well decomposed organic soil material mixed with mineral soil material. The content of organic matter is more than 20 percent.

Munsell notation. A designation of color by degrees of the three single variables—hue, value, and chroma. For example, a notation of 10YR 6/4 is a color of 10YR hue, value of 6, and chroma of 4.

Neutral soil. A soil having a pH value between 6.6 and 7.3.

Nutrient, plant. Any element taken in by a plant, essential to its growth, and used by it in the production of food and tissue. Plant nutrients are nitrogen, phosphorus, potassium, calcium, magnesium, sulfur, iron, manganese, copper, boron, zinc, and perhaps other elements obtained from the soil; and carbon, hydrogen, and oxygen obtained largely from the air and water.

Parent material. The great variety of unconsolidated organic and mineral material in which soil forms. Consolidated bedrock is not yet parent material by this concept.

Peat. Unconsolidated material, largely undecomposed organic matter, that has accumulated under excess moisture.

Percolation. The downward movement of water through the soil.

Percs slowly. The slow movement of water through the soil adversely affecting the specified use.

Permeability. The quality that enables the soil to transmit water or air, measured as the number of inches per hour that water moves through the soil. Terms describing permeability are *very slow* (less than 0.06 inch), *slow* (0.06 to 0.20 inch), *moderately slow* (0.2 to 0.6 inch), *moderate* (0.6 to 2.0 inches), *moderately rapid* (2.0 to 6.0 inches), *rapid* (6.0 to 20 inches), and *very rapid* (more than 20 inches).

Phase, soil. A subdivision of a soil series or other unit in the soil classification system based on differences in the soil that affect its management. A soil series, for example, may be divided into phases on the bases of differences in slope, stoniness, thickness, or some other characteristic that affects management. These differences are too small to justify separate series.

pH value. (See Reaction, soil). A numerical designation of acidity and alkalinity in soil.

Piping. Moving water of subsurface tunnels or pipelike cavities in the soil.

Plasticity index. The numerical difference between the liquid limit and the plastic limit; the range of moisture content within which the soil remains plastic.

Poorly graded. Refers to soil material consisting mainly of particles of nearly the same size. Because there is little difference in size of the particles, density can be increased only slightly by compaction.

Productivity (soil). The capability of a soil for producing a specified plant or sequence of plants under a specified system of management. Productivity is measured in terms of output, or harvest, in relation to input.

Profile, soil. A vertical section of the soil extending through all its horizons and into the parent material.

Range (or rangeland). Land that, for the most part, produces native plants suitable for grazing by livestock; includes land supporting some forest trees.

Range condition. The health or productivity of forage plants on a given range, in terms of the potential productivity under normal climate and the best practical management. Condition classes generally recognized are—*excellent*, *good*, *fair*, and *poor*. The classification is based on the percentage of original, or assumed climax vegetation on a site, as compared to what has been observed to grow on it when well managed.

Range site. An area of range where climate, soil, and relief are sufficiently uniform to produce a distinct kind and amount of native vegetation.

Reaction, soil. The degree of acidity or alkalinity of a soil, expressed in pH values. A soil that tests to pH 7.0 is described as precisely neutral in reaction because it is neither acid nor alkaline. The degree of acidity or alkalinity is expressed as—

	pH
Extremely acid	Below 4.5
Very strongly acid	4.5 to 5.0
Strongly acid	5.1 to 5.5
Medium acid	5.6 to 6.0
Slightly acid	6.1 to 6.5
Neutral	6.6 to 7.3
Mildly alkaline	7.4 to 7.8
Moderately alkaline	7.9 to 8.4
Strongly alkaline	8.5 to 9.0
Very strongly alkaline	9.1 and higher

Residuum (residual soil material). Unconsolidated, weathered, or partly weathered mineral material that accumulates over disintegrating rock.

Rill. A steep sided channel resulting from accelerated erosion. A rill is generally a few inches deep and not wide enough to be an obstacle to farm machinery.

Rock fragments. Rock or mineral fragments having a diameter of 2 millimeters or more; for example, pebbles, cobbles, stones, and boulders.

Rooting depth. Shallow root zone. The soil is shallow over a layer that greatly restricts roots. See Root zone.

Root zone. The part of the soil that can be penetrated by plant roots.

Runoff. The precipitation discharged in stream channels from a drainage area. The water that flows off the land surface without sinking in is called surface runoff; that which enters the ground before reaching surface streams is called ground-water runoff or seepage flow from ground water.

Saline soil. A soil containing soluble salts in an amount that impairs growth of plants. A saline soil does not contain excess exchangeable sodium.

Sand. As a soil separate, individual rock or mineral fragments from 0.05 millimeter to 2.0 millimeters in diameter. Most sand grains consist of quartz. As a soil textural class, a soil that is 85 percent or more sand and not more than 10 percent clay.

Sandstone. Sedimentary rock containing dominantly sand-size particles.

Sedimentary rock. Rock made up of particles deposited from suspension in water. The chief kinds of sedimentary rock are conglomerate, formed from gravel; sandstone, formed from sand; shale, formed from clay; and limestone, formed from soft masses of calcium carbonate. There are many intermediate types. Some wind-deposited sand is consolidated into sandstone.

Seepage. The rapid movement of water through the soil. Seepage adversely affects the specified use.

Series, soil. A group of soils, formed from a particular type of parent material, having horizons that, except for the texture of the A or surface horizon, are similar in all profile characteristics and in arrangement in the soil profile. Among these characteristics are color, texture, structure, reaction, consistence, and mineralogical and chemical composition.

Shale. Sedimentary rock formed by the hardening of a clay deposit.

Sheet erosion. The removal of a fairly uniform layer of soil material from the land surface by the action of rainfall and runoff water.

Shrink-swell. The shrinking of soil when dry and the swelling when wet. Shrinking and swelling can damage roads, dams, building foundations, and other structures. It can also damage plant roots.

Silt. As a soil separate, individual mineral particles that range in diameter from the upper limit of clay (0.002 millimeter) to the lower limit of very fine sand (0.05 millimeter). As a soil textural class, soil that is 80 percent or more silt and less than 12 percent clay.

Siltstone. Sedimentary rock made up of dominantly silt-sized particles.

Site index. A designation of the quality of a forest site based on the height of the dominant stand at an arbitrarily chosen age. For example, if the average height attained by dominant and codominant trees in a fully stocked stand at the age of 50 years is 75 feet, the site index is 75 feet.

Slope. The inclination of the land surface from the horizontal. Percentage of slope is the vertical distance divided by horizontal distance, then multiplied by 100. Thus, a slope of 20 percent is a drop of 20 feet in 100 feet of horizontal distance.

Slow intake. The slow movement of water into the soil.

Small stones. Rock fragments 3 to 10 inches (7.5 to 25 centimeters) in diameter. Small stones adversely affect the specified use.

Soil. A natural, three-dimensional body at the earth's surface that is capable of supporting plants and has properties resulting from the integrated effect of climate and living matter acting on earthy parent material, as conditioned by relief over periods of time.

Soil separates. Mineral particles less than 2 millimeters in equivalent diameter and ranging between specified size limits. The names and sizes of separates recognized in the United States are as follows: *very coarse sand* (2.0 millimeters to 1.0 millimeter); *coarse sand* (1.0 to 0.5 millimeter); *medium sand* (0.5 to 0.25 millimeter); *fine sand* (0.25 to 0.10 millimeter); *very fine sand* (0.10 to 0.05 millimeter); *silt* (0.005 to 0.002 millimeter); and *clay* (less than 0.002 millimeter).

Solum. The upper part of a soil profile, above the C horizon, in which the processes of soil formation are active. The solum in mature soil consists of the A and B horizons. Generally, the characteristics of the material in these horizons are unlike those of the underlying

material. The living roots and other plant and animal life characteristics of the soil are largely confined to the solum.

Stones. Rock fragments 10 to 24 inches (25 to 60 centimeters) in diameter.

Stony. Refers to a soil containing stones in numbers that interfere with or prevent tillage.

Stratified. Arranged in strata, or layers. The term refers to geologic material. Layers in soils that result from the processes of soil formation are called horizons; those inherited from the parent material are called strata.

Stripcropping. Growing crops in a systematic arrangement of strips or bands which provide vegetative barriers to wind and water erosion.

Structure, soil. The arrangement of primary soil particles into compound particles or aggregates that are separated from adjoining aggregates. The principal forms of soil structure are—*platy* (laminated), *prismatic* (vertical axis of aggregates longer than horizontal), *columnar* (prisms with rounded tops), *blocky* (angular or subangular), and *granular*. *Structureless* soils are either *single grained* (each grain by itself, as in dune sand) or *massive* (the particles adhering without any regular cleavage, as in many hardpans).

Stubble mulch. Stubble or other crop residue left on the soil, or partly worked into the soil, to provide protection from soil blowing and water erosion after harvest, during preparation of a seedbed for the next crop, and during the early growing period of the new crop.

Subsoil. Technically, the B horizon; roughly, the part of the solum below plow depth.

Substratum. The part of the soil below the solum.

Subsurface layer. Technically, the A2 horizon. Generally refers to a leached horizon lighter in color and lower in content of organic matter than the overlying surface layer.

Summer fallow. The tillage of uncropped land during the summer to control weeds and allow storage of moisture in the soil for the growth of a later crop. A practice common in semiarid regions, where annual precipitaion is not enough to produce a crop every year. Summer fallow is frequently practiced before planting winter grain.

Surface soil. The soil ordinarily moved in tillage, or its equivalent in uncultivated soil, ranging in depth from 4 to 10 inches (10 to 25 centimeters). Frequently designated as the "plow layer," or the "Ap horizon."

Terrace. An embankment, or ridge, constructed across sloping soils on the contour or at a slight angle to the contour. The terrace intercepts surface runoff so that it can soak into the soil or flow slowly to a prepared outlet without harm. A terrace in a field is generally built so that the field can be farmed. A terrace intended mainly for drainage has a deep channel that is maintained in permanent sod.

Terrace (geologic). An old alluvial plain, ordinarily flat or undulating, bordering a river, a lake, or the sea. A stream terrace is frequently called a second bottom, in contrast with a flood plain, and is seldom subject to overflow. A marine terrace, generally wide, was deposited by the sea.

Texture, soil. The relative proportions of sand, silt, and clay particles in a mass of soil. The basic textural classes, in order of increasing proportion of fine particles, are *sand, loamy sand, sandy loam, loam, silt, silt loam, sandy clay loam, clay loam, silty clay loam, sandy clay, silty clay,* and *clay*. The sand, loamy sand, and sandy loam classes may be further divided by specifying "coarse," "fine," or " very fine."

Thin layer. Otherwise suitable soil material too thin for the specified use.

Tilth, soil. The condition of the soil, especially the soil structure, as related to the growth of plants. Good tilth refers to the friable state and is associated with high noncapillary porosity and stable structure. A soil in poor tilth is nonfriable, hard, nonaggregated, and difficult to till.

Topsoil (engineering). Presumably a fertile soil or soil material, or one that responds to fertilization, ordinarily rich in organic matter, used to topdress roadbanks, lawns, and gardens.

Upland (geology). Land at a higher elevation, in general, than the alluvial plain or stream terrace; land above the lowlands along streams.

Unstable fill. Risk of caving or sloughing in banks of fill material.

Water table. The upper limit of the soil or underlying rock material that is wholly saturated with water.

Water table, apparent. A thick zone of free water in the soil. An apparent water table is indicated by the level at which water stands in an uncased borehole after adequate time is allowed for adjustment in the surrounding soil.

Water table, artesian. A water table under hydrostatic head, generally beneath an impermeable layer. When this layer is penetrated, the water level rises in an uncased borehole.

Water table, perched. A water table standing above an unsaturated zone. In places an upper, or perched, water table is separated from a lower one by a dry zone.

Weathering. All physical and chemical changes produced in rocks or other deposits at or near the earth's surface by atmospheric agents. These changes result in disintegration and decomposition of the material.

Well graded. Refers to a soil or soil material consisting of particles well distributed over a wide range in size or diameter. Such a soil normally can be easily increased in density and bearing properties by compaction. Contrasts with poorly graded soil.

Wilting point (or permanent wilting point). The moisture content of soil, on an ovendry basis, at which a plant (specifically sunflower) wilts so much that it does not recover when placed in a humid, dark chamber.

Illustrations

Figure 1.—Area of Ellicott loamy coarse sand, 0 to 5 percent slopes.

Figure 2.—Area of Kutler-Broadmoor-Rock outcrop complex, 25 to 90 percent slopes. Kutler soil at left, and tree covered Broadmoor soil at right. Colorado Springs in background.

Figure 3.—Area of Louviers cobbly clay loam, 5 to 40 percent slopes.

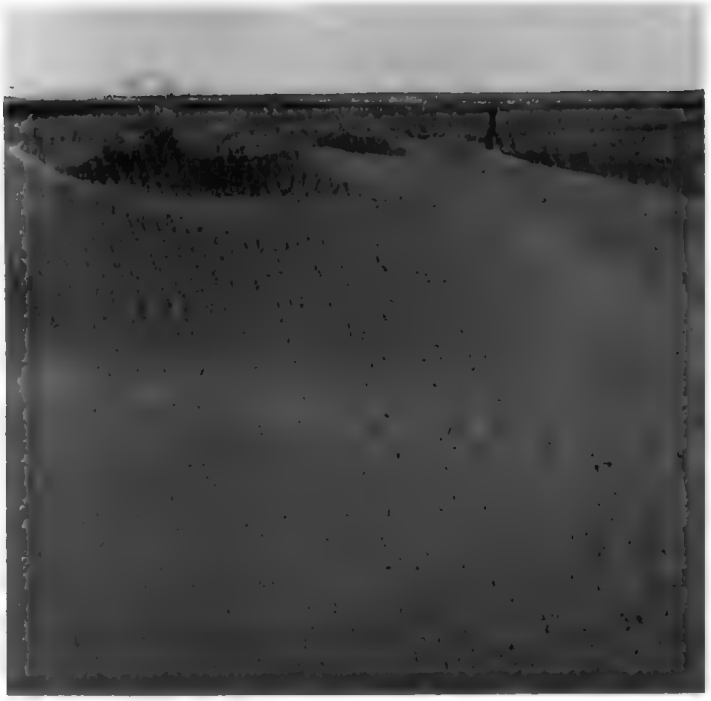


Figure 4.—Material deposited by soil blowing in area of Olney and Vona soils, eroded.

Figure 5.—Area of Travessilla-Rock outcrop complex, 8 to 90 percent slopes, in foreground. Light area at upper right is a quarry in an area of Paunsaugunt-Rock outcrop complex, 15 to 65 percent slopes. Pikes Peak in background.

Figure 6.—Area of Travessilla-Rock outcrop complex, 8 to 90 percent slopes. Urban development at lower left.

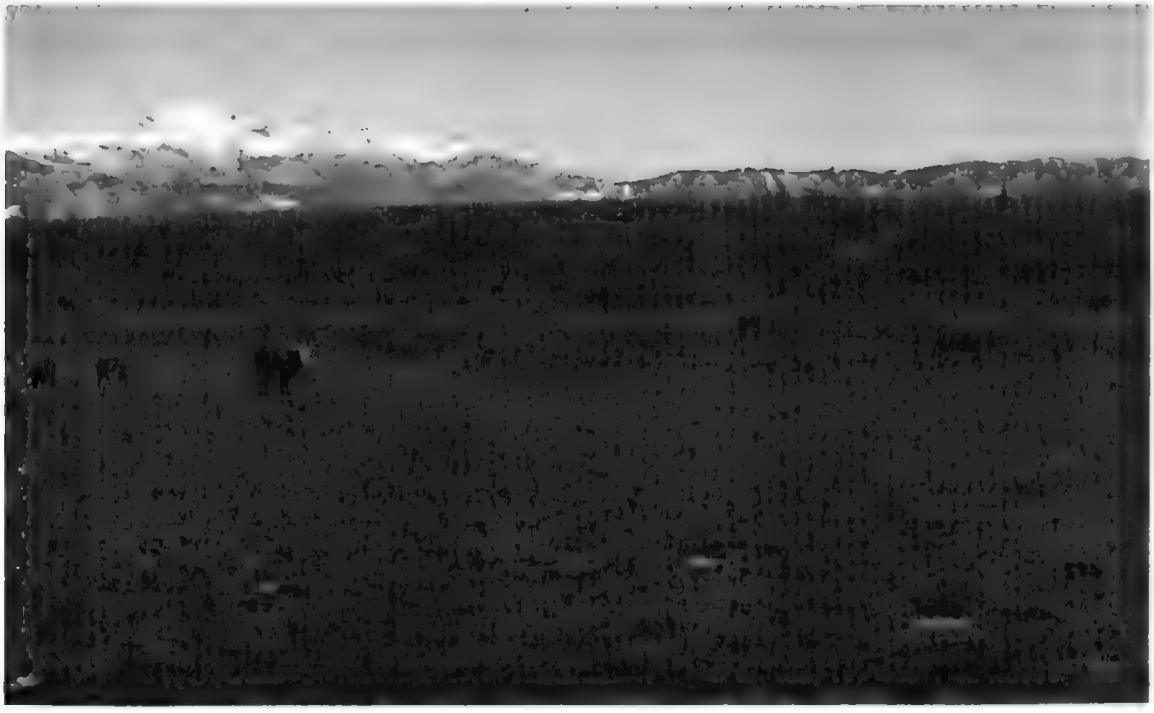


Figure 7.—Area of Sandy Foothills range site on Truckton sandy loam, 0 to 3 percent slopes.

Figure 8.—Profile of a Bernal sandy loam in an area of Stapleton-Bernal sandy loams, 3 to 20 percent slopes.

Figure 9.—Profile of an Elbeth sandy loam.

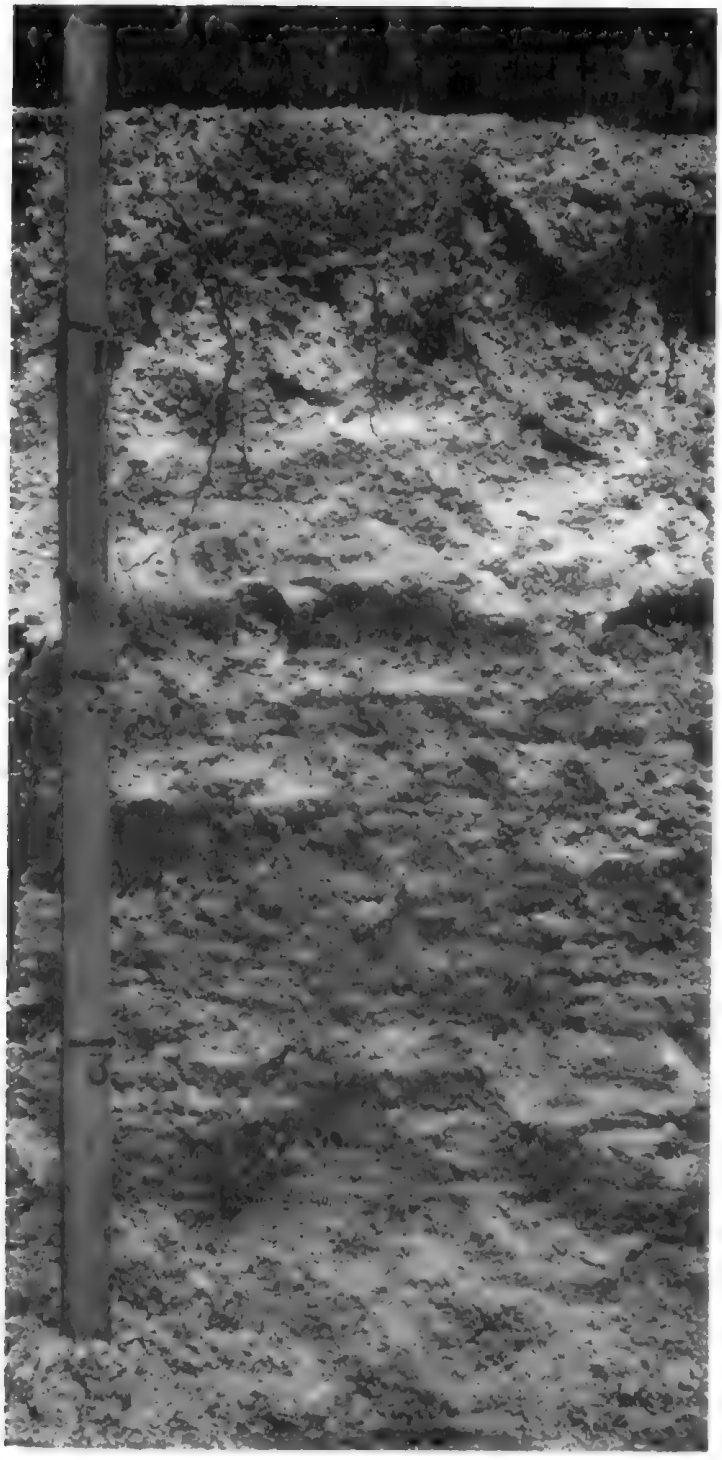


Figure 10.—Profile of a Kettle gravelly loamy sand.

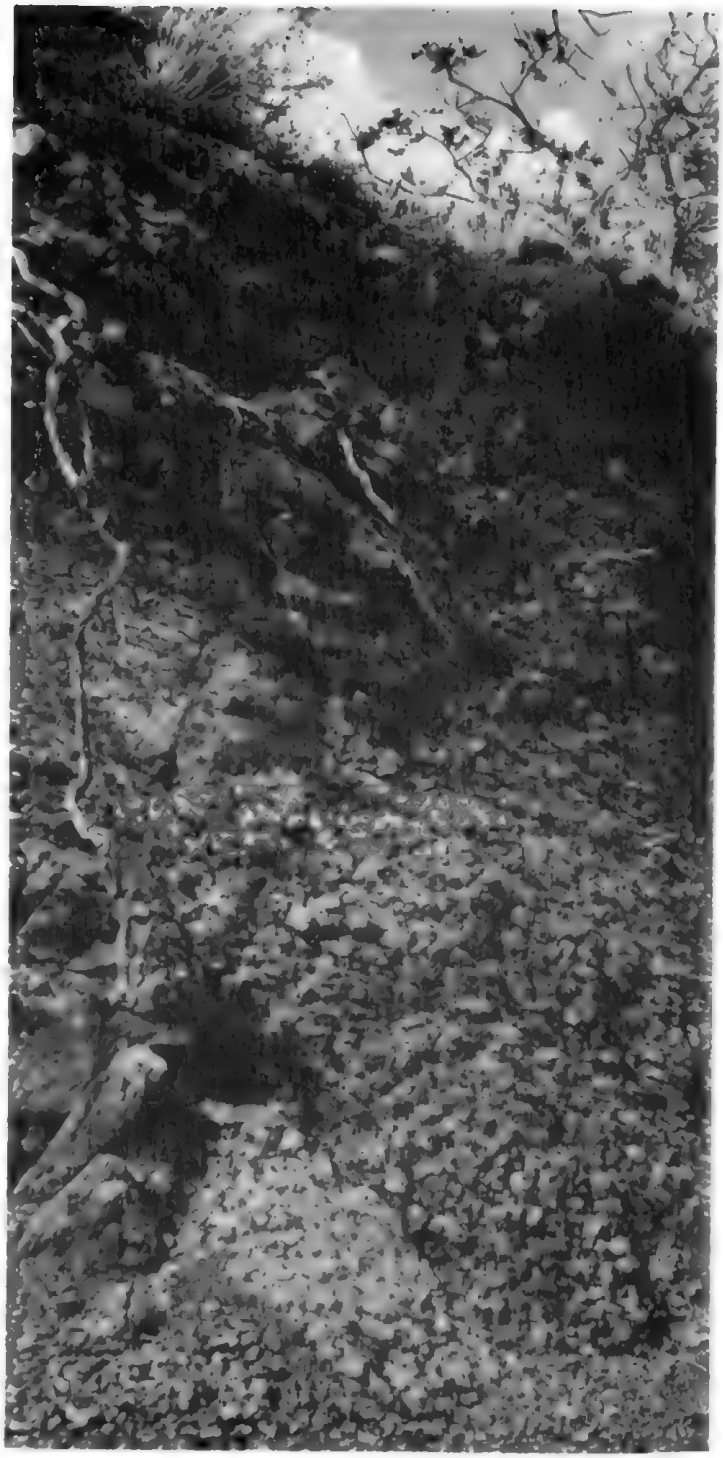


Figure 11.—Profile of a Kutler very gravelly sandy loam.

Tables

TABLE 1.--TEMPERATURE AND PRECIPITATION DATA

Month	Temperature[1]						Precipitation[1]				
	Average daily maximum	Average daily minimum	Average daily	2 years in 10 will have--		Average number of growing degree days[2]	Average	2 years in 10 will have--		Average number of days with 0.10 inch or more	Average snowfall
				Maximum temperature higher than--	Minimum temperature lower than--			Less than--	More than--		
	°F	°F	°F	°F	°F		In	In	In		In
January	43.1	16.2	29.7	67	-13	27	.27	.07	.42	1	4.3
February	45.2	18.9	32.1	70	-8	46	.32	.13	.46	1	4.7
March	48.6	22.7	35.7	75	-1	81	.73	.29	1.08	2	9.0
April	59.0	31.9	45.5	80	12	203	1.18	.27	1.88	3	7.3
May	68.8	42.3	55.6	88	26	484	2.26	.95	3.32	5	1.3
June	79.6	51.1	65.4	96	37	762	2.01	.63	3.11	4	.0
July	84.6	56.9	70.7	98	46	952	3.05	1.83	4.13	8	.0
August	82.6	55.3	69.0	95	44	899	2.37	1.10	3.40	6	.0
September	74.7	46.9	60.8	91	31	624	1.40	.66	2.01	3	1.9
October	64.3	36.7	50.5	83	17	340	.84	.17	1.35	2	3.5
November	50.8	24.5	37.7	73	0	80	.49	.13	.78	2	5.2
December	44.3	18.0	31.2	70	-4	25	.29	.08	.45	1	4.5
Year	62.1	35.1	48.7	98	-16	4,523	15.21	11.45	18.73	38	41.7

[1]Recorded in the period 1951-73 at Colorado Springs, Colorado.

[2]A growing degree day is an index of the amount of heat available for plant growth. It can be calculated by adding the maximum and minimum daily temperatures, dividing the sum by 2, and subtracting the temperature below which growth is minimal for the principal crops in the area (40° F).

TABLE 2.--FREEZE DATES IN SPRING AND FALL

Probability	Minimum temperature[1]		
	24° F or lower	28° F or lower	32° F or lower
Last freezing temperature in spring:			
1 year in 10 later than--	May 4	May 14	May 22
2 years in 10 later than--	April 28	May 9	May 17
5 years in 10 later than--	April 17	April 30	May 8
First freezing temperature in fall:			
1 year in 10 earlier than--	October 11	September 29	September 19
2 years in 10 earlier than--	October 16	October 5	September 25
5 years in 10 earlier than--	October 26	October 16	October 7

[1]Recorded in the period 1951-73 at Colorado Springs, Colorado.

TABLE 3.--GROWING SEASON LENGTH

Probability	Daily minimum temperature during growing season[1]		
	Higher than 24° F	Higher than 28° F	Higher than 32° F
	Days	Days	Days
9 years in 10	168	152	126
8 years in 10	176	158	135
5 years in 10	191	168	151
2 years in 10	207	179	167
1 year in 10	215	184	176

[1]Recorded in the period 1951-73 at Colorado Springs, Colorado.

TABLE 4.--ACREAGE AND PROPORTIONATE EXTENT OF THE SOILS

Map symbol	Soil name	Acres	Percent
1	Alamosa loam, 1 to 3 percent slopes	2,440	0.2
2	Ascalon sandy loam, 1 to 3 percent slopes	30,470	2.4
3	Ascalon sandy loam, 3 to 9 percent slopes	28,740	2.3
4	Badland	3,720	0.3
5	Bijou loamy sand, 1 to 8 percent slopes	18,800	1.5
6	Bijou sandy loam, 1 to 3 percent slopes	14,910	1.2
7	Bijou sandy loam, 3 to 8 percent slopes	18,770	1.5
8	Blakeland loamy sand, 1 to 9 percent slopes	77,410	6.2
9	Blakeland complex, 1 to 9 percent slopes	6,560	0.5
10	Blendon sandy loam, 0 to 3 percent slopes	12,380	1.0
11	Bresser sandy loam, 0 to 3 percent slopes	25,670	2.0
12	Bresser sandy loam, 3 to 5 percent slopes	40,950	3.3
13	Bresser sandy loam, 5 to 9 percent slopes	6,530	0.5
14	Brussett loam, 1 to 3 percent slopes	1,080	0.1
15	Brussett loam, 3 to 5 percent slopes	4,570	0.4
16	Chaseville gravelly sandy loam, 1 to 8 percent slopes	4,130	0.3
17	Chaseville gravelly sandy loam, 8 to 40 percent slopes	1,720	0.1
18	Chaseville-Midway complex	5,170	0.4
19	Columbine gravelly sandy loam, 0 to 3 percent slopes	26,380	2.1
20	Connerton-Rock outcrop complex, 8 to 90 percent slopes	4,500	0.4
21	Cruckton sandy loam, 1 to 9 percent slopes	1,790	0.1
22	Cushman loam, 1 to 5 percent slopes	5,640	0.4
23	Cushman loam, 5 to 15 percent slopes	4,060	0.3
24	Cushman-Kutch complex, 3 to 12 percent slopes	6,120	0.5
25	Elbeth sandy loam, 3 to 8 percent slopes	6,590	0.5
26	Elbeth sandy loam, 8 to 15 percent slopes	8,080	0.6
27	Elbeth-Pring complex, 5 to 30 percent slopes	2,870	0.2
28	Ellicott loamy coarse sand, 0 to 5 percent slopes	27,220	2.2
29	Fluvaquentic Haplaquolls, nearly level	4,130	0.3
30	Fort Collins loam, 0 to 3 percent slopes	11,090	0.9
31	Fort Collins loam, 3 to 8 percent slopes	8,120	0.6
32	Fortwingate-Rock outcrop complex, 15 to 60 percent slopes	4,160	0.3
33	Heldt clay loam, 0 to 3 percent slopes	6,760	0.5
34	Holderness loam, 1 to 5 percent slopes	1,260	0.1
35	Holderness loam, 5 to 8 percent slopes	740	0.1
36	Holderness loam, 8 to 15 percent slopes	810	0.1
37	Jarre gravelly sandy loam, 1 to 8 percent slopes	1,520	0.1
38	Jarre-Tecolote complex, 8 to 65 percent slopes	12,950	1.0
39	Keith silt loam, 0 to 3 percent slopes	5,380	0.4
40	Kettle gravelly loamy sand, 3 to 8 percent slopes	13,830	1.1
41	Kettle gravelly loamy sand, 8 to 40 percent slopes	23,600	1.9
42	Kettle-Rock outcrop complex	6,390	0.5
43	Kim loam, 1 to 8 percent slopes	3,860	0.3
44	Kutch clay loam, 3 to 5 percent slopes	2,810	0.2
45	Kutch clay loam, 5 to 20 percent slopes	2,030	0.2
46	Kutler-Broadmoor-Rock outcrop complex, 25 to 90 percent slopes	9,600	0.8
47	Limon clay, 0 to 3 percent slopes	10,110	0.8
48	Louviers silty clay loam, 3 to 18 percent slopes	2,540	0.2
49	Louviers cobbly clay loam, 5 to 40 percent slopes	610	(1)
50	Manvel loam, 3 to 9 percent slopes	1,420	0.1
51	Manzanola clay loam, 0 to 1 percent slopes	2,030	0.2
52	Manzanola clay loam, 1 to 3 percent slopes	8,080	0.6
53	Manzanola clay loam, 3 to 9 percent slopes	2,200	0.2
54	Midway clay loam, 3 to 25 percent slopes	8,660	0.7
55	Nederland cobbly sandy loam, 9 to 25 percent slopes	4,060	0.3
56	Nelson-Tassel fine sandy loams, 3 to 18 percent slopes	11,940	1.0
57	Neville fine sandy loam, 3 to 9 percent slopes	3,480	0.3
58	Neville-Rednun complex, 3 to 9 percent slopes	2,430	0.2
59	Nunn clay loam, 0 to 3 percent slopes	7,610	0.6
60	Olney sandy loam, 0 to 3 percent slopes	44,100	3.5
61	Olney sandy loam, 3 to 5 percent slopes	25,500	2.0
62	Olney and Vona soils, eroded	18,020	1.4
63	Paunsaugunt-Rock outcrop complex, 15 to 65 percent slopes	1,390	0.1
64	Penrose-Manvel complex, 3 to 45 percent slopes	3,180	0.3
65	Perrypark gravelly sandy loam, 3 to 9 percent slopes	980	0.1
66	Peyton sandy loam, 1 to 5 percent slopes	1,320	0.1
67	Peyton sandy loam, 5 to 9 percent slopes	5,740	0.5
68	Peyton-Pring complex, 3 to 8 percent slopes	17,210	1.4
69	Peyton-Pring complex, 8 to 15 percent slopes	12,850	1.0
70	Pits, gravel	140	(1)

See footnote at end of table.

TABLE 4.--ACREAGE AND PROPORTIONATE EXTENT OF THE SOILS--Continued

Map symbol	Soil name	Acres	Percent
71	Pring coarse sandy loam, 3 to 8 percent slopes	22,620	1.8
72	Pring coarse sandy loam, 8 to 15 percent slopes	7,680	0.6
73	Razor clay loam, 3 to 9 percent slopes	3,750	0.3
74	Razor stony clay loam, 5 to 15 percent slopes	3,420	0.3
75	Razor-Midway complex	33,310	2.7
76	Rizozo-Neville complex, 3 to 30 percent slopes	8,860	0.7
77	Rock outcrop-Coldcreek-Tolman complex, 9 to 90 percent slopes	15,150	1.2
78	Sampson loam, 0 to 3 percent slopes	9,400	0.7
79	Satanta loam, 0 to 3 percent slopes	4,900	0.4
80	Satanta loam, 3 to 5 percent slopes	1,590	0.1
81	Satanta-Neville complex, 3 to 8 percent slopes	2,160	0.2
82	Schamber-Razor complex, 8 to 50 percent slopes	16,500	1.3
83	Stapleton sandy loam, 3 to 8 percent slopes	8,720	0.7
84	Stapleton sandy loam, 8 to 15 percent slopes	5,310	0.4
85	Stapleton-Bernal sandy loams, 3 to 20 percent slopes	6,020	0.5
86	Stoneham sandy loam, 3 to 8 percent slopes	17,350	1.4
87	Stoneham sandy loam, 8 to 15 percent slopes	5,820	0.5
88	Stroupe-Travessilla-Rock outcrop complex, 9 to 90 percent slopes	7,470	0.6
89	Tassel fine sandy loam, 3 to 18 percent slopes	3,690	0.3
90	Terry sandy loam, 1 to 8 percent slopes	2,400	0.2
91	Terry-Razor complex, 3 to 20 percent slopes	3,280	0.3
92	Tomah-Crowfoot loamy sands, 3 to 8 percent slopes	13,160	1.0
93	Tomah-Crowfoot loamy sands, 8 to 15 percent slopes	6,940	0.6
94	Travessilla-Rock outcrop complex, 8 to 90 percent slopes	5,380	0.4
95	Truckton loamy sand, 1 to 9 percent slopes	16,060	1.3
96	Truckton sandy loam, 0 to 3 percent slopes	31,080	2.5
97	Truckton sandy loam, 3 to 9 percent slopes	72,980	5.8
98	Truckton-Blakeland complex, 9 to 20 percent slopes	2,600	0.2
99	Truckton-Bresser complex, 5 to 20 percent slopes	7,470	0.6
100	Truckton-Bresser complex, eroded	9,710	0.8
101	Ustic Torrifluvents, loamy	24,920	2.0
102	Valent sand, 1 to 9 percent slopes	61,310	4.9
103	Valent sand, 9 to 20 percent slopes	11,400	0.9
104	Vona sandy loam, 1 to 3 percent slopes	9,840	0.8
105	Vona sandy loam, 3 to 9 percent slopes	29,250	2.3
106	Wigton loamy sand, 1 to 8 percent slopes	21,410	1.7
107	Wiley silt loam, 1 to 3 percent slopes	4,230	0.3
108	Wiley silt loam, 3 to 9 percent slopes	10,340	0.8
109	Yoder gravelly sandy loam, 1 to 8 percent slopes	5,750	0.5
110	Yoder gravelly sandy loam, 8 to 25 percent slopes	2,500	0.2
	Military impact area, (unsurveyed)	7,800	0.6
	Water	400	(1)
	Total	1,255,840	100.0

[1]Less than 0.1 percent.

TABLE 5.--ESTIMATED POTENTIAL YIELDS PER ACRE OF CROPS

[Yields in columns N are for nonirrigated soils; those in columns I are for irrigated soils. All yields were estimated for a high level of management. Absence of a yield figure indicates the crop is seldom grown or is not suited. Only arable soils are listed]

Soil name and map symbol	Alfalfa hay		Corn		Corn silage		Grain sorghum		Grass-legume hay		Wheat	
	N	I	N	I	N	I	N	I	N	I	N	I
	Ton	Ton	Bu	Bu	Ton	Ton	Bu	Bu	Ton	Ton	Bu	Bu
Alamosa:												
1	---	---	---	---	---	---	---	---	---	2.0	---	---
Ascalon:												
2	---	---	18	---	---	---	15	---	---	---	20	---
3	---	---	---	---	---	---	12	---	---	---	17	---
Bijou:												
5	---	3.5	---	90	---	---	---	---	---	---	---	---
6	---	4.0	10	100	---	20	---	---	---	---	---	---
Blakeland:												
8	---	3	---	65	---	---	---	---	---	---	---	---
Bresser:												
11	---	4.5	20	110	---	22	---	---	---	---	22	---
12	---	---	18	---	---	---	---	---	---	---	20	---
13	---	---	---	---	---	---	---	---	---	---	16	---
Brussett:												
14	---	---	---	---	---	---	---	---	---	---	23	---
15	---	---	---	---	---	---	---	---	---	---	20	---
Cruckton:												
21	---	---	---	---	---	---	---	---	---	---	20	---
Cushman:												
22	---	---	---	---	---	---	---	---	---	---	18	---
Fort Collins:												
30	---	---	---	---	---	---	14	---	---	---	18	---
Heldt:												
33	---	4.0	---	100	---	20	---	---	---	---	---	---
Holderness:												
34	---	---	---	---	---	---	---	---	---	---	20	---
35, 36	---	---	---	---	---	---	---	---	---	---	17	---
Keith:												
39	---	4.5	---	120	---	21	---	---	---	---	18	---
Kutch:												
44	---	---	---	---	---	---	---	---	---	---	20	---
Limon:												
47	---	3.5	---	---	---	---	---	---	---	---	---	---
Manzanola:												
51	---	4.0	---	90	---	19	---	---	---	---	20	40
52	---	3.5	---	80	---	18	---	---	---	---	20	40
Nunn:												
59	---	4.0	---	100	---	20	---	---	---	---	20	60
Olney:												
60	---	---	---	---	---	---	14	---	---	---	14	---

TABLE 5.--ESTIMATED POTENTIAL YIELDS PER ACRE OF CROPS--Continued

Soil name and map symbol	Alfalfa hay		Corn		Corn silage		Grain sorghum		Grass-legume hay		Wheat	
	N	I	N	I	N	I	N	I	N	I	N	I
	Ton	Ton	Bu	Bu	Ton	Ton	Bu	Bu	Ton	Ton	Bu	Bu
Olney:												
61	---	---	---	---	---	---	12	---	---	---	12	---
Peyton:												
66	---	---	---	---	---	---	---	---	---	---	23	---
67	---	---	---	---	---	---	---	---	---	---	20	---
Razor:												
73	1.5	---	---	---	---	---	---	---	---	---	---	---
Sampson:												
78	---	5.0	---	100	---	20	---	---	---	---	22	55
Satanta:												
79	---	---	---	---	---	---	---	---	---	---	22	---
80	---	---	---	---	---	---	---	---	---	---	20	---
Truckton:												
96	---	4.0	---	95	---	20	---	---	---	---	20	---
Ustic Torrifluvents:												
101	---	4.0	---	100	---	20	---	---	---	---	---	---
Vona:												
104	---	3.5	---	100	---	18	14	---	---	---	12	---
Wigton:												
106	---	3.5	---	90	---	17	---	---	---	---	---	---

TABLE 6.--RANGE PRODUCTIVITY AND COMPOSITION

[Soils not listed are not in range sites; such soils can be used for grazing if grass cover is established]

Soil name and map symbol	Range site name	Potential production		Common plant name	Composition
		Kind of year	Dry weight		
			Lb/acre		Pct
Alamosa:					
1	Mountain meadow	Favorable	4,000	Tufted hairgrass	35
		Normal	2,500	Sedge	15
		Unfavorable	2,000	Bluejoint reedgrass	10
				Slender wheatgrass	10
				Baltic rush	5
				Shrubby cinquefoil	5
				Willow	5
Ascalon:					
2, 3	Sandy plains	Favorable	2,000	Blue grama	25
		Normal	1,400	Western wheatgrass	20
		Unfavorable	800	Needleandthread	10
				Sand bluestem	10
				Big bluestem	8
				Sedge	5
				Prairie sandreed	5
				Sand sagebrush	5
Bijou:					
5, 6, 7	Sandy plains	Favorable	2,000	Blue grama	25
		Normal	1,400	Needleandthread	15
		Unfavorable	800	Prairie sandreed	10
				Sand dropseed	10
				Sand bluestem	5
				Red threeawn	5
				Switchgrass	5
				Sedge	5
Blakeland:					
8	Sandy foothills	Favorable	1,800	Prairie sandreed	20
		Normal	1,500	Sand bluestem	15
		Unfavorable	1,000	Blue grama	15
				Thickspike wheatgrass	10
				Little bluestem	5
				Needleandthread	5
				Sand dropseed	5
				Sedge	5
				Fringed sagebrush	5
[1]9:					
Blakeland part	Sandy foothills	Favorable	1,800	Prairie sandreed	20
		Normal	1,500	Sand bluestem	15
		Unfavorable	1,000	Blue grama	15
				Thickspike wheatgrass	10
				Little bluestem	5
				Needleandthread	5
				Sand dropseed	5
				Sedge	5
				Fringed sagebrush	5
Fluvaquentic Haplaquolls part	Sandy meadow	Favorable	3,300	Switchgrass	25
		Normal	2,500	Sand bluestem	10
		Unfavorable	1,600	Western wheatgrass	10
				Bluegrass	10
				Prairie sandreed	5
				Canada wildrye	5
				Sedge	5
				Indiangrass	5
Blendon:					
10	Sandy foothills	Favorable	1,800	Prairie sandreed	20
		Normal	1,500	Sand bluestem	15
		Unfavorable	1,000	Blue grama	15
				Thickspike wheatgrass	10

See footnote at end of table.

TABLE 6.--RANGE PRODUCTIVITY AND COMPOSITION--Continued

Soil name and map symbol	Range site name	Potential production		Common plant name	Composition
		Kind of year	Dry weight		
			Lb/acre		Pct
Bresser:					
11, 12, 13	Sandy foothills	Favorable	1,800	Prairie sandreed	20
		Normal	1,500	Blue grama	15
		Unfavorable	1,000	Sand bluestem	10
				Thickspike wheatgrass	10
				Junegrass	5
				Sedge	5
Brussett:					
14, 15	Loamy park	Favorable	1,800	Mountain muhly	20
		Normal	1,200	Arizona fescue	15
		Unfavorable	900	Prairie junegrass	10
				Western wheatgrass	10
				Needlegrass	10
				Bluegrass	5
				Parry oatgrass	5
				Little bluestem	5
				Nodding bromegrass	5
				Elk sedge	5
Chaseville:					
16, 17	Gravelly foothills	Favorable	1,000	Little bluestem	15
		Normal	900	Needleandthread	15
		Unfavorable	700	Prairie sandreed	15
				Mountain muhly	10
				Side-oats grama	10
				Blue grama	8
				Western wheatgrass	5
[1]18:					
Chaseville part	Gravelly foothills	Favorable	1,000	Little bluestem	15
		Normal	900	Needleandthread	15
		Unfavorable	700	Prairie sandreed	15
				Mountain muhly	10
				Side-oats grama	10
				Blue grama	8
				Western wheatgrass	5
Midway part	Shaly foothills	Favorable	1,000	Western wheatgrass	50
		Normal	900	Blue grama	15
		Unfavorable	700	Green needlegrass	10
				Fourwing saltbush	5
				Winterfat	5
Columbine:					
19	Gravelly foothills	Favorable	1,000	Little bluestem	20
		Normal	900	Needleandthread	15
		Unfavorable	700	Prairie sandreed	15
				Mountain muhly	10
				Side-oats grama	10
				Blue grama	8
				Western wheatgrass	5
Connerton:					
[1]20:					
Connerton part	Loamy foothills	Favorable	1,400	Blue grama	25
		Normal	1,000	Western wheatgrass	15
		Unfavorable	800	Green needlegrass	10
				Bluegrass	10
				Needleandthread	10
				Prairie junegrass	5
Rock outcrop part.					

See footnote at end of table.

TABLE 6.--RANGE PRODUCTIVITY AND COMPOSITION--Continued

Soil name and map symbol	Range site name	Potential production		Common plant name	Composition
		Kind of year	Dry weight		
			Lb/acre		Pct
Cruckton:					
21	Sandy divide	Favorable	2,000	Blue grama	20
		Normal	1,600	Prairie sandreed	15
		Unfavorable	1,000	Western wheatgrass	10
				Little bluestem	6
				Bluegrass	6
				Needleandthread	5
				Pine dropseed	5
				Mountain muhly	5
Cushman:					
22, 23	Loamy foothills	Favorable	1,700	Blue grama	25
		Normal	1,200	Western wheatgrass	15
		Unfavorable	800	Needleandthread	10
				Sedge	5
				Green needlegrass	5
[1]24:					
Cushman part	Loamy foothills	Favorable	1,700	Blue grama	25
		Normal	1,200	Western wheatgrass	15
		Unfavorable	800	Needleandthread	10
				Sedge	5
				Green needlegrass	5
Kutch part	Clayey foothills	Favorable	1,200	Western wheatgrass	50
		Normal	900	Green needlegrass	10
		Unfavorable	600	Blue grama	10
				Sedge	5
				Side-oats grama	5
Elbeth:					
[1]27:					
Elbeth part.					
Pring part	Loamy park	Favorable	1,800	Arizona fescue	20
		Normal	1,600	Bluegrass	20
		Unfavorable	1,200	Mountain muhly	15
				Needlegrass	10
				Blue grama	10
				Prairie junegrass	5
				Gambel oak	5
Ellicott:					
28	Sandy bottomland	Favorable	1,500	Switchgrass	30
		Normal	1,200	Sand dropseed	15
		Unfavorable	800	Sand reedgrass	10
				Sand bluestem	10
				Sand sagebrush	5
Fluvaquentic Haplaquolls:					
29*	Sandy meadow	Favorable	3,300	Switchgrass	25
		Normal	2,500	Sand bluestem	10
		Unfavorable	1,600	Prairie sandreed	10
				Western wheatgrass	10
				Bluegrass	10
				Canada wildrye	5
				Sedge	5
Fort Collins:					
30, 31	Loamy plains	Favorable	1,500	Blue grama	40
		Normal	1,100	Western wheatgrass	20
		Unfavorable	800	Buffalograss	10
				Sedge	5
				Needleandthread	5

See footnote at end of table.

TABLE 6.--RANGE PRODUCTIVITY AND COMPOSITION--Continued

Soil name and map symbol	Range site name	Potential production		Common plant name	Composition
		Kind of year	Dry weight		
			Lb/acre		Pct
Fortwingate:					
[1]32:					
Fortwingate part	Shallow foothills	Favorable	500	Mountainmahogany	20
		Normal	400	Blue grama	10
		Unfavorable	300	Bluegrass	10
				Fringed sagebrush	10
				Little bluestem	5
				Side-oats grama	5
				Sedge	5
Rock outcrop part.					
Heldt:					
33	Alkaline plains	Favorable	1,600	Western wheatgrass	25
		Normal	1,200	Alkali sacaton	15
		Unfavorable	900	Blue grama	15
				Sedge	5
				Prairie junegrass	5
Holderness:					
34, 35, 36	Loamy park	Favorable	1,900	Wheatgrass	25
		Normal	1,500	Needleandthread	10
		Unfavorable	1,200	Prairie junegrass	8
				Blue grama	5
				Bluegrass	5
				Arizona fescue	5
				Little bluestem	5
				Mountain muhly	5
				Mountain brome	5
				Elk sedge	5
Jarre.					
37	Loamy park	Favorable	1,800	Western wheatgrass	20
		Normal	1,500	Blue grama	15
		Unfavorable	1,200	Needlegrass	10
				Arizona fescue	10
				Mountain muhly	8
				Prairie junegrass	5
				Mountain brome	5
[1]38:					
Jarre part	Loamy park	Favorable	1,800	Western wheatgrass	20
		Normal	1,500	Blue grama	15
		Unfavorable	1,200	Needlegrass	10
				Arizona fescue	10
				Mountain muhly	8
				Prairie junegrass	5
				Mountain brome	5
Tecolote part.					
Keith:					
39	Loamy plains	Favorable	1,500	Blue grama	40
		Normal	1,100	Western wheatgrass	15
		Unfavorable	800	Needleandthread	15
				Sedge	5
Kim:					
43	Loamy plains	Favorable	1,400	Blue grama	50
		Normal	1,100	Western wheatgrass	10
		Unfavorable	700	Side-oats grama	10
				Galleta	5
				Sand dropseed	5
Kutch:					
44, 45	Clayey foothills	Favorable	1,200	Western wheatgrass	50
		Normal	900	Green needlegrass	10
		Unfavorable	600	Blue grama	10
				Side-oats grama	5
				Sedge	5

See footnote at end of table.

TABLE 6.--RANGE PRODUCTIVITY AND COMPOSITION--Continued

Soil name and map symbol	Range site name	Potential production		Common plant name	Composition
		Kind of year	Dry weight		
			Lb/acre		Pct
Kutler:					
[1]46:					
Kutler part	Loamy park	Favorable	2,000	Mountain muhly	30
		Normal	1,500	Little bluestem	10
		Unfavorable	700	Birchleaf mountainmahogany	10
				Big bluestem	5
				Side-oats grama	5
				Pine dropseed	5
				Gamble oak	5
Broadmoor part.					
Rock outcrop part.					
Limon:					
47	Salt flats	Favorable	800	Alkali sacaton	40
		Normal	600	Western wheatgrass	15
		Unfavorable	400	Blue grama	10
				Buffalograss	5
				Galleta	5
				Greasewood	5
Louviers:					
48, 49	Shaly foothills	Favorable	600	Western wheatgrass	35
		Normal	400	Blue grama	30
		Unfavorable	350	Side-oats grama	10
				Green needlegrass	5
				Spike muhly	5
Manvel:					
50	Loamy plains	Favorable	1,000	Blue grama	50
		Normal	800	Galleta	10
		Unfavorable	500	Winterfat	10
				Sand dropseed	5
				Western wheatgrass	5
Manzanola:					
51, 52	Saline overflow	Favorable	1,800	Alkali sacaton	35
		Normal	1,500	Western wheatgrass	20
		Unfavorable	1,200	Galleta	10
				Buffalograss	5
				Switchgrass	5
53	Loamy plains	Favorable	1,000	Blue grama	50
		Normal	800	Western wheatgrass	15
		Unfavorable	500	Galleta	10
				Buffalograss	5
Midway:					
54	Shaly plains	Favorable	700	Blue grama	25
		Normal	600	Galleta	20
		Unfavorable	400	Western wheatgrass	15
				Alkali sacaton	5
				Fourwing saltbush	5
Nederland:					
55	Gravelly foothills	Favorable	1,200	Mountain muhly	15
		Normal	1,000	Blue grama	12
		Unfavorable	800	Little bluestem	10
				Western wheatgrass	8
				Prairie junegrass	7
				Side-oats grama	6
				Needleandthread	5
Nelson:					
[1]56:					
Nelson part	Sandy plains	Favorable	1,700	Blue grama	45
		Normal	1,500	Prairie junegrass	10
		Unfavorable	800	Side-oats grama	8
				Little bluestem	5
				Needleandthread	5

See footnote at end of table.

TABLE 6.--RANGE PRODUCTIVITY AND COMPOSITION--Continued

Soil name and map symbol	Range site name	Potential production		Common plant name	Composition
		Kind of year	Dry weight		
			Lb/acre		Pct
Nelson:					
[1]56:					
Tassel part-----	Sandy plains----------	Favorable	1,700	Blue grama----------	40
		Normal	1,100	Prairie sandreed----------	10
		Unfavorable	750	Side-oats grama----------	10
				Needleandthread----------	10
				Little bluestem----------	5
Neville:					
57----------	Loamy foothills----------	Favorable	1,500	Blue grama----------	25
		Normal	1,200	Western wheatgrass----------	15
		Unfavorable	900	Needlegrass----------	15
				Prairie junegrass----------	15
				Indian ricegrass----------	5
				Side-oats grama----------	5
[1]58:					
Neville part----	Loamy foothills----------	Favorable	1,500	Blue grama----------	25
		Normal	1,200	Western wheatgrass----------	15
		Unfavorable	900	Needlegrass----------	15
				Prairie junegrass----------	15
				Indian ricegrass----------	5
				Side-oats grama----------	5
Rednun part-----	Loamy foothills----------	Favorable	1,500	Western wheatgrass----------	25
		Normal	1,200	Blue grama----------	20
		Unfavorable	900	Prairie junegrass----------	20
				Green needlegrass----------	10
				Bluegrass----------	5
Nunn:					
59----------	Clayey plains----------	Favorable	1,300	Blue grama----------	40
		Normal	950	Western wheatgrass----------	25
		Unfavorable	800	Buffalograss----------	10
				Fourwing saltbush----------	8
Olney:					
60, 61----------	Sandy plains----------	Favorable	1,500	Blue grama----------	35
		Normal	900	Sand dropseed----------	20
		Unfavorable	600	Little bluestem----------	10
				Needlegrass----------	5
				Prairie sandreed----------	5
				Yucca----------	5
[1]62:					
Olney part------	Sandy plains----------	Favorable	1,500	Blue grama----------	40
		Normal	900	Sand dropseed----------	20
		Unfavorable	600	Little bluestem----------	10
				Needlegrass----------	5
				Prairie sandreed----------	5
Vona part-------	Sandy plains----------	Favorable	1,600	Blue grama----------	35
		Normal	1,400	Wheatgrass----------	10
		Unfavorable	800	Sand dropseed----------	10
				Side-oats grama----------	8
				Little bluestem----------	5
				Prairie sandreed----------	5
				Sedge----------	5
Paunsaugunt:					
[1]63:					
Paunsaugunt part	Rocky loam----------	Favorable	900	Arizona fescue----------	25
		Normal	700	Mountain muhly----------	20
		Unfavorable	500	Needlegrass----------	10
				Bluegrass----------	5
				Parry oatgrass----------	5
				Junegrass----------	5
				Western wheatgrass----------	5
Rock outcrop part.					

See footnote at end of table.

TABLE 6.--RANGE PRODUCTIVITY AND COMPOSITION--Continued

Soil name and map symbol	Range site name	Potential production		Common plant name	Composition
		Kind of year	Dry weight		
			Lb/acre		Pct
Penrose:					
[1]64:					
Penrose part	Shallow foothills	Favorable	500	Mountainmahogany	20
		Normal	400	Blue grama	15
		Unfavorable	300	Bluegrass	10
				Fringed sagebrush	10
				Side-oats grama	10
				Little bluestem	10
Manvel part	Loamy foothills	Favorable	1,400	Blue grama	30
		Normal	1,200	Galleta	15
		Unfavorable	800	Winterfat	10
				Sand dropseed	5
				Western wheatgrass	5
Perrypark:					
65	Loamy park	Favorable	2,000	Mountain muhly	15
		Normal	1,400	Western wheatgrass	15
		Unfavorable	1,000	Little bluestem	10
				Prairie sandreed	10
				Big bluestem	10
				Needleandthread	7
				Arizona fescue	5
				Blue grama	5
Peyton:					
66, 67	Sandy divide	Favorable	2,000	Prairie sandreed	25
		Normal	1,500	Mountain muhly	15
		Unfavorable	900	Sand bluestem	10
				Little bluestem	10
				Blue grama	10
				Prairie junegrass	10
				Western wheatgrass	5
[1]68:					
Peyton part	Sandy divide	Favorable	2,000	Prairie sandreed	25
		Normal	1,500	Mountain muhly	15
		Unfavorable	900	Sand bluestem	10
				Little bluestem	10
				Blue grama	10
				Prairie junegrass	10
				Western wheatgrass	5
Pring part	Loamy park	Favorable	1,800	Arizona fescue	20
		Normal	1,600	Bluegrass	20
		Unfavorable	1,200	Mountain muhly	15
				Needlegrass	10
				Blue grama	10
				Prairie junegrass	5
				Gambel oak	5
[1]69:					
Peyton part	Sandy divide	Favorable	2,000	Prairie sandreed	25
		Normal	1,500	Mountain muhly	15
		Unfavorable	900	Sand bluestem	10
				Little bluestem	10
				Blue grama	10
				Prairie junegrass	10
				Western wheatgrass	5
Pring part	Loamy park	Favorable	1,800	Arizona fescue	20
		Normal	1,600	Bluegrass	20
		Unfavorable	1,200	Mountain muhly	15
				Needlegrass	10
				Blue grama	10
				Prairie junegrass	5
				Gambel oak	5

See footnote at end of table.

TABLE 6.--RANGE PRODUCTIVITY AND COMPOSITION--Continued

Soil name and map symbol	Range site name	Potential production		Common plant name	Composition
		Kind of year	Dry weight		
			Lb/acre		Pct
Pring:					
71, 72	Loamy park	Favorable	1,800	Arizona fescue	20
		Normal	1,600	Bluegrass	20
		Unfavorable	1,200	Mountain muhly	15
				Needlegrass	10
				Blue grama	10
				Prairie junegrass	5
				Gambel oak	5
Razor:					
73	Alkaline plains	Favorable	1,500	Alkali sacaton	25
		Normal	1,200	Western wheatgrass	20
		Unfavorable	900	Blue grama	15
				Galleta	10
				Inland saltgrass	5
				Sedge	5
74	Clayey foothills	Favorable	1,200	Western wheatgrass	40
		Normal	800	Blue grama	15
		Unfavorable	500	Green needlegrass	10
				Rubber rabbitbrush	5
				Snakeweed	5
[1]75:					
Razor part	Alkaline plains	Favorable	1,500	Alkali sacaton	25
		Normal	1,200	Western wheatgrass	20
		Unfavorable	900	Blue grama	15
				Inland saltgrass	5
				Sedge	5
Midway part	Shaly plains	Favorable	700	Blue grama	25
		Normal	600	Galleta	20
		Unfavorable	400	Western wheatgrass	15
				Alkali sacaton	5
				Fourwing saltbush	5
Rizozo:					
[1]76:					
Rizozo part	Shallow foothills	Favorable	1,000	Side-oats grama	20
		Normal	800	Little bluestem	20
		Unfavorable	400	Blue grama	20
				Fringed sagebrush	10
				Sedge	5
Neville part	Loamy foothills	Favorable	1,500	Blue grama	25
		Normal	1,200	Western wheatgrass	15
		Unfavorable	900	Needlegrass	15
				Prairie junegrass	15
				Indian ricegrass	5
				Side-oats grama	5
Rock outcrop:					
[1]77:					
Rock outcrop part.					
Coldcreek part.					
Tolman part	Shallow loam	Favorable	900	Arizona fescue	25
		Normal	700	Mountain muhly	20
		Unfavorable	500	Needlegrass	10
				Bluegrass	5
				Parry oatgrass	5
				Junegrass	5
				Western wheatgrass	5
Sampson:					
78	Loamy foothills	Favorable	1,500	Western wheatgrass	25
		Normal	1,200	Blue grama	25
		Unfavorable	800	Green needlegrass	10
				Prairie junegrass	5
				Bluegrass	5

See footnote at end of table.

TABLE 6.--RANGE PRODUCTIVITY AND COMPOSITION--Continued

Soil name and map symbol	Range site name	Potential production		Common plant name	Composition
		Kind of year	Dry weight		
			Lb/acre		Pct
Satanta:					
79, 80	Loamy foothills	Favorable	1,500	Blue grama	20
		Normal	1,200	Needlegrass	20
		Unfavorable	800	Western wheatgrass	20
				Side-oats grama	10
[1]81:					
Satanta part	Loamy foothills	Favorable	1,500	Blue grama	20
		Normal	1,200	Needlegrass	20
		Unfavorable	800	Western wheatgrass	20
				Side-oats grama	10
Neville part	Loamy foothills	Favorable	1,500	Blue grama	25
		Normal	1,200	Western wheatgrass	15
		Unfavorable	900	Needlegrass	15
				Prairie junegrass	15
				Indian ricegrass	5
				Side-oats grama	5
Schamber:					
[1]82:					
Schamber part	Gravel breaks	Favorable	1,200	Side-oats grama	25
		Normal	800	Blue grama	35
		Unfavorable	600	Needleandthread	20
				Fourwing saltbush	5
Razor part	Alkaline plains	Favorable	1,500	Alkali sacaton	25
		Normal	1,200	Western wheatgrass	20
		Unfavorable	900	Blue grama	15
				Saltgrass	5
				Sedge	5
Stapleton:					
83, 84	Gravelly foothills	Favorable	1,000	Blue grama	30
		Normal	800	Little bluestem	10
		Unfavorable	700	Side-oats grama	10
				Western wheatgrass	10
				Needleandthread	5
				Mountain muhly	5
				Thickspike wheatgrass	5
				Sedge	5
				Prairie junegrass	5
[1]85:					
Stapleton part	Gravelly foothills	Favorable	1,000	Blue grama	30
		Normal	800	Little bluestem	10
		Unfavorable	700	Side-oats grama	10
				Western wheatgrass	10
				Needleandthread	5
				Mountain muhly	5
				Thickspike wheatgrass	5
				Sedge	5
				Prairie junegrass	5
Bernal part	Shallow foothills	Favorable	500	Blue grama	25
		Normal	400	Side-oats grama	15
		Unfavorable	300	Indian ricegrass	10
				Western wheatgrass	10
				Fringed sagebrush	10
				Little bluestem	5
Stoneham:					
86, 87	Sandy plains	Favorable	1,500	Blue grama	40
		Normal	900	Sand dropseed	20
		Unfavorable	600	Little bluestem	20
				Needlegrass	5
				Prairie sandreed	5

See footnote at end of table.

TABLE 6.--RANGE PRODUCTIVITY AND COMPOSITION--Continued

Soil name and map symbol	Range site name	Potential production		Common plant name	Composition
		Kind of year	Dry weight		
			Lb/acre		Pct
Tassel:					
89	Sandy plains	Favorable	1,700	Blue grama	40
		Normal	1,100	Prairie sandreed	10
		Unfavorable	750	Side-oats grama	10
				Needleandthread	10
				Little bluestem	5
Terry:					
90	Sandy foothills	Favorable	1,700	Prairie sandreed	25
		Normal	1,500	Blue grama	20
		Unfavorable	1,000	Prairie junegrass	10
				Side-oats grama	8
				Little bluestem	5
				Needleandthread	5
[1]91:					
Terry part	Sandy foothills	Favorable	1,700	Prairie sandreed	25
		Normal	1,500	Blue grama	20
		Unfavorable	1,000	Prairie junegrass	10
				Side-oats grama	8
				Little bluestem	5
				Needleandthread	5
Razor part	Clayey foothills	Favorable	1,500	Western wheatgrass	40
		Normal	1,200	Green needlegrass	15
		Unfavorable	900	Blue grama	10
				Bluegrass	5
Tomah:					
[1]92:					
Tomah part	Sandy divide	Favorable	2,500	Blue grama	20
		Normal	1,400	Prairie sandreed	15
		Unfavorable	1,000	Gambel oak	15
				Western wheatgrass	10
				Needleandthread	5
				Mountain muhly	5
				Mountain brome	5
Crowfoot part	Sandy divide	Favorable	2,500	Mountain muhly	15
		Normal	1,400	Bluestem	15
		Unfavorable	1,000	Mountain brome	12
				Needleandthread	10
				Blue grama	8
				Sedge	5
				Bluegrass	5
				Prairie sandreed	5
				Fringed sagebrush	5
[1]93:					
Tomah part	Sandy divide	Favorable	2,500	Blue grama	20
		Normal	1,400	Prairie sandreed	15
		Unfavorable	1,000	Gambel oak	15
				Western wheatgrass	10
				Needleandthread	5
				Mountain muhly	5
				Mountain brome	5
Crowfoot part	Sandy divide	Favorable	2,500	Mountain muhly	15
		Normal	1,400	Bluestem	15
		Unfavorable	1,000	Mountain brome	12
				Needleandthread	10
				Blue grama	8
				Sedge	5
				Bluegrass	5
				Prairie sandreed	5
				Fringed sagebrush	5

See footnote at end of table.

TABLE 6.--RANGE PRODUCTIVITY AND COMPOSITION--Continued

Soil name and map symbol	Range site name	Potential production		Common plant name	Composition
		Kind of year	Dry weight		
			Lb/acre		Pct
Truckton:					
95	Sandy foothills	Favorable	2,000	Prairie sandreed	30
		Normal	1,600	Blue grama	20
		Unfavorable	1,200	Needleandthread	10
				Sand dropseed	10
				Western wheatgrass	5
				Sand bluestem	5
96, 97	Sandy foothills	Favorable	1,800	Blue grama	35
		Normal	1,500	Prairie sandreed	15
		Unfavorable	1,200	Needleandthread	10
				Sand dropseed	10
				Western wheatgrass	5
				Sedge	5
[1]98:					
Truckton part	Sandy foothills	Favorable	1,800	Blue grama	35
		Normal	1,500	Prairie sandreed	15
		Unfavorable	1,200	Needleandthread	10
				Sand dropseed	10
				Western wheatgrass	5
				Sedge	5
Blakeland part	Sandy foothills	Favorable	1,800	Prairie sandreed	20
		Normal	1,500	Sand bluestem	15
		Unfavorable	1,000	Blue grama	15
				Thickspike wheatgrass	10
				Little bluestem	5
				Needleandthread	5
				Sand dropseed	5
				Sedge	5
				Fringed sagebrush	5
[1]99:					
Truckton part	Sandy foothills	Favorable	1,800	Blue grama	35
		Normal	1,500	Prairie sandreed	15
		Unfavorable	1,200	Needleandthread	10
				Sand dropseed	10
				Western wheatgrass	5
				Sedge	5
Bresser part	Sandy foothills	Favorable	1,800	Prairie sandreed	20
		Normal	1,500	Blue grama	15
		Unfavorable	1,200	Sand bluestem	10
				Thickspike wheatgrass	10
				Junegrass	5
				Sedge	5
[1]100:					
Truckton part	Sandy foothills	Favorable	1,800	Blue grama	35
		Normal	1,500	Prairie sandreed	15
		Unfavorable	1,200	Needleandthread	10
				Sand dropseed	10
				Western wheatgrass	5
				Sedge	5
Bresser part	Sandy foothills	Favorable	1,800	Prairie sandreed	20
		Normal	1,500	Blue grama	15
		Unfavorable	1,200	Sand bluestem	10
				Thickspike wheatgrass	10
				Junegrass	5
				Sedge	5
Ustic Torrifluvents:					
101	Overflow	Favorable	2,500	Western wheatgrass	40
		Normal	1,800	Blue grama	20
		Unfavorable	1,000	Side-oats grama	10
				Switchgrass	5
				Sand dropseed	5

See footnote at end of table.

TABLE 6.--RANGE PRODUCTIVITY AND COMPOSITION--Continued

Soil name and map symbol	Range site name	Potential production		Common plant name	Composition
		Kind of year	Dry weight		
			Lb/acre		Pct
Valent:					
102	Deep sand	Favorable	2,000	Prairie sandreed	20
		Normal	1,500	Sand bluestem	15
		Unfavorable	1,000	Sand dropseed	10
				Needlegrass	10
				Blue grama	10
				Sand sagebrush	10
				Indian ricegrass	5
103	Choppy sands	Favorable	1,500	Prairie sandreed	10
		Normal	1,000	Sand bluestem	10
		Unfavorable	600	Sand dropseed	10
				Needlegrass	10
				Blue grama	5
				Sandhill muhly	5
				Indian ricegrass	5
Vona:					
104, 105	Sandy plains	Favorable	1,600	Blue grama	35
		Normal	1,400	Wheatgrass	10
		Unfavorable	800	Sand dropseed	10
				Side-oats grama	8
				Little bluestem	5
				Prairie sandreed	5
				Sedge	5
Wigton:					
106	Deep sand	Favorable	1,800	Blue grama	15
		Normal	1,400	Prairie sandreed	15
		Unfavorable	1,000	Needlegrass	10
				Sand bluestem	10
				Little bluestem	5
				Sand dropseed	5
				Side-oats grama	5
				Prairie junegrass	5
				Switchgrass	5
Wiley:					
107, 108	Loamy plains	Favorable	1,000	Blue grama	60
		Normal	800	Galleta	8
		Unfavorable	400	Western wheatgrass	7
				Sand dropseed	5
				Buffalograss	5
Yoder:					
109, 110	Gravelly foothills	Favorable	1,000	Blue grama	35
		Normal	800	Little bluestem	10
		Unfavorable	700	Side-oats grama	10
				Western wheatgrass	10
				Needleandthread	5
				Prairie junegrass	5
				Mountain muhly	5
				Thickspike wheatgrass	5
				Sedge	5

[1]This map unit is made up of two or more dominant kinds of soil. See map unit description for the composition and behavior characteristics of the map unit.

TABLE 7.--WOODLAND MANAGEMENT AND PRODUCTIVITY

[Only the soils suitable for production of merchantable trees are listed in this table. Absence of an entry in a column means the information was not available]

Soil name and map symbol	Ordination symbol	Management concerns				Potential productivity		Trees to plant
		Erosion hazard	Equipment limitation	Seedling mortality	Plant competition	Merchantable trees	Site index	
Elbeth:								
25, 26	6o	Slight	Slight	Slight	Slight	Ponderosa pine	52	Ponderosa pine, Douglas-fir, white fir, blue spruce.
[1]27:								
Elbeth part	6o	Slight	Slight	Slight	Slight	Ponderosa pine	52	Ponderosa pine, Douglas-fir, white fir, blue spruce.
Pring part.								
Fortwingate:								
[1]32:								
Fortwingate part	6r	Severe	Moderate	Slight	Slight	One-seed juniper	20	---
						Pinyon pine	---	
Rock outcrop part.								
Jarre:								
[1]38:								
Jarre part.								
Tecolote part	6x	Severe	Severe	Moderate	Slight	Ponderosa pine	50	Ponderosa pine.
						Douglas-fir	45	
Kettle:								
40, 41	6o	Moderate	Slight	Slight	Slight	Ponderosa pine	55	Ponderosa pine, Douglas-fir, white fir.
[1]42:								
Kettle part	6o	Moderate	Slight	Slight	Slight	Ponderosa pine	55	Ponderosa pine, Douglas-fir, white fir.
Rock outcrop part.								
Kutler:								
[1]46:								
Kutler part.								
Broadmoor part	5f	Severe	Severe	Moderate	Slight	Douglas-fir	49	Douglas-fir, ponderosa pine, white fir.
						Ponderosa pine	---	
						White fir	---	
Rock outcrop part.								
Rock outcrop:								
[1]77:								
Rock outcrop part.								
Coldcreek part	5r	Severe	Severe	Slight	Slight	Ponderosa pine	65	Ponderosa pine, Douglas-fir.
						Douglas-fir	46	
Tolman part.								

[1]This map unit is made up of two or more dominant kinds of soil. See map unit description for the composition and behavior characteristics of the map unit.

TABLE 8.--BUILDING SITE DEVELOPMENT

["Depth to rock" and some of the other terms that describe restrictive soil features are defined in the Glossary. See text for definitions of "slight," "moderate," and "severe." Absence of an entry means soil was not rated]

Soil name and map symbol	Shallow excavations	Dwellings without basements	Dwellings with basements	Small commercial buildings	Local roads and streets
Alamosa:					
1	Severe: wetness, floods.	Severe: floods, wetness.	Severe: floods, wetness.	Severe: floods, wetness.	Severe: wetness, floods, frost action.
Ascalon:					
2	Slight	Moderate: low strength.	Moderate: shrink-swell, low strength.	Moderate: low strength.	Moderate: frost action, low strength, shrink-swell.
3	Slight	Moderate: low strength.	Moderate: shrink-swell, low strength.	Moderate: slope, shrink-swell, low strength.	Moderate: frost action, low strength, shrink-swell.
Badland:					
4.					
Bijou:					
5, 7	Severe: cutbanks cave.	Slight	Slight	Moderate: slope.	Slight.
6	Severe: cutbanks cave.	Slight	Slight	Slight	Slight.
Blakeland:					
8	Severe: cutbanks cave.	Slight	Slight	Moderate: slope.	Slight.
9:					
Blakeland part	Severe: cutbanks cave.	Slight	Slight	Moderate: slope.	Slight.
Fluvaquentic Haplaquolls part	Severe: wetness, floods.	Severe: wetness, floods.	Severe: wetness, floods.	Severe: wetness, floods.	Severe: wetness, floods, frost action.
Blendon:					
10	Severe: cutbanks cave.	Slight	Slight	Slight	Moderate: low strength, frost action.
Bresser:					
11	Slight	Slight	Slight	Slight	Slight.
12, 13	Slight	Slight	Slight	Moderate: slope.	Slight.
Brussett:					
14	Moderate: too clayey.	Moderate: shrink-swell, low strength.	Slight	Moderate: shrink-swell, low strength.	Moderate: low strength, frost action, shrink-swell.
15	Moderate: too clayey.	Moderate: shrink-swell, low strength.	Slight	Moderate: slope, low strength, shrink-swell.	Moderate: low strength, frost action, shrink-swell.

See footnote at end of table.

TABLE 8.--BUILDING SITE DEVELOPMENT--Continued

Soil name and map symbol	Shallow excavations	Dwellings without basements	Dwellings with basements	Small commercial buildings	Local roads and streets
Chaseville:					
16	Severe: cutbanks cave.	Slight	Slight	Moderate: slope.	Slight.
17	Severe: cutbanks cave, slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.
[1]18:					
Chaseville part	Severe: cutbanks cave, slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.
Midway part	Severe: slope, too clayey, depth to rock.	Severe: slope, shrink-swell, low strength.	Severe: slope, shrink-swell, low strength.	Severe: slope, shrink-swell, low strength.	Severe: slope, shrink-swell, low strength.
Columbine:					
19	Severe: cutbanks cave.	Slight	Slight	Slight	Slight.
Connerton:					
[1]20:					
Connerton part	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: low strength, frost action.
Rock outcrop part.					
Cruckton:					
21	Slight	Slight	Slight	Moderate. slope.	Moderate: frost action, low strength.
Cushman:					
22	Moderate: depth to rock.	Moderate: low strength.	Moderate: depth to rock.	Moderate: low strength.	Moderate: low strength, frost action.
23	Moderate: depth to rock, slope.	Moderate: low strength, slope.	Moderate: slope, depth to rock.	Severe: slope.	Moderate: slope, low strength, frost action.
[1]24:					
Cushman part	Moderate: depth to rock.	Moderate: low strength.	Moderate: depth to rock.	Severe: slope.	Moderate: low strength, frost action.
Kutch part	Severe: too clayey.	Severe: shrink-swell.	Severe: shrink-swell.	Severe: shrink-swell.	Severe: shrink-swell, low strength.
Elbeth:					
25	Slight	Moderate: shrink-swell.	Moderate: shrink-swell.	Moderate: shrink-swell, slope.	Moderate: shrink-swell, frost action, low strength.
26	Moderate: slope.	Moderate: shrink-swell, slope.	Moderate: shrink-swell, slope.	Severe: slope.	Moderate: slope, shrink-swell, low strength.
[1]27:					
Elbeth part	Moderate: slope.	Moderate: shrink-swell, slope.	Moderate: shrink-swell, slope.	Severe: slope.	Moderate: slope, shrink-swell, low strength.

See footnote at end of table.

TABLE 8.--BUILDING SITE DEVELOPMENT--Continued

Soil name and map symbol	Shallow excavations	Dwellings without basements	Dwellings with basements	Small commercial buildings	Local roads and streets
Elbeth: [1]27: Pring part	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.
Ellicott: 28	Severe: cutbanks cave, floods.	Severe: floods.	Severe: floods.	Severe: floods.	Severe: floods.
Fluvaquentic Haplaquolls: 29	Severe: wetness, floods.	Severe: wetness, floods.	Severe: wetness, floods.	Severe: wetness, floods.	Severe: wetness, floods, frost action.
Fort Collins: 30	Slight	Moderate: low strength, shrink-swell.	Moderate: low strength, shrink-swell.	Moderate: low strength, shrink-swell.	Moderate: low strength, shrink-swell, frost action.
31	Slight	Moderate: low strength, shrink-swell.	Moderate: low strength, shrink-swell.	Moderate: slope, low strength, shrink-swell.	Moderate: low strength, shrink-swell, frost action.
Fortwingate: [1]32: Fortwingate part	Severe: depth to rock, slope.	Severe: shrink-swell, slope.	Severe: depth to rock, shrink-swell, slope.	Severe: shrink-swell, slope.	Severe: shrink-swell, slope, low strength.
Rock outcrop part.					
Heldt: 33	Severe: too clayey.	Severe: shrink-swell, low strength.	Severe: shrink-swell, low strength.	Severe: shrink-swell, low strength.	Severe: shrink-swell, low strength.
Holderness: 34, 35	Moderate: too clayey.	Severe: shrink-swell.	Moderate: shrink-swell, low strength.	Severe: shrink-swell.	Severe: shrink-swell, low strength.
36	Moderate: too clayey, slope.	Severe: shrink-swell.	Moderate: slope, shrink-swell, low strength.	Severe: shrink-swell, slope.	Severe: shrink-swell, low strength.
Jarre: 37	Slight	Moderate: shrink-swell, low strength.	Slight	Moderate: slope, shrink-swell, low strength.	Moderate: frost action, shrink-swell, low strength.
[1]38: Jarre part	Moderate: slope.	Moderate: slope, shrink-swell, low strength.	Moderate: slope.	Severe: slope.	Moderate: slope, shrink-swell, low strength.
Tecolote part	Severe: slope, small stones.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.

See footnote at end of table.

TABLE 8.--BUILDING SITE DEVELOPMENT--Continued

Soil name and map symbol	Shallow excavations	Dwellings without basements	Dwellings with basements	Small commercial buildings	Local roads and streets
Keith:					
39	Slight	Moderate: shrink-swell.	Moderate: shrink-swell.	Moderate: shrink-swell.	Severe: frost action.
Kettle:					
40	Slight	Slight	Slight	Moderate: slope.	Moderate: frost action.
41	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.
[1]42:					
Kettle part	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.
Rock outcrop part.					
Kim:					
43	Slight	Moderate: low strength.	Moderate: low strength.	Moderate: low strength, slope.	Moderate: low strength, frost action.
Kutch:					
44	Severe: too clayey.	Severe: shrink-swell.	Severe: shrink-swell.	Severe: shrink-swell.	Severe: shrink-swell, low strength.
45	Severe: too clayey.	Severe: shrink-swell.	Severe: shrink-swell.	Severe: shrink-swell, slope.	Severe: shrink-swell, low strength.
Kutler:					
[1]46:					
Kutler part	Severe: slope, small stones, depth to rock.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.
Broadmoor part	Severe: slope, small stones, depth to rock.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.
Rock outcrop part.					
Limon:					
47	Severe: floods, too clayey.	Severe: floods, shrink-swell.	Severe: floods, shrink-swell.	Severe: floods, shrink-swell.	Severe: floods, shrink-swell, low strength.
Louviers:					
48	Severe: depth to rock.	Severe: shrink-swell, depth to rock.	Severe: shrink-swell, depth to rock.	Severe: shrink-swell, depth to rock, slope.	Severe: low strength, shrink-swell.
49	Severe: slope, depth to rock.	Severe: shrink-swell, depth to rock, slope.	Severe: shrink-swell, depth to rock, slope.	Severe: shrink-swell, depth to rock, slope.	Severe: low strength, shrink-swell, slope.
Manvel:					
50	Slight	Moderate: low strength, shrink-swell.	Moderate: low strength, shrink-swell.	Moderate: low strength, slope, shrink-swell.	Severe: frost action.

See footnote at end of table.

TABLE 8.--BUILDING SITE DEVELOPMENT--Continued

Soil name and map symbol	Shallow excavations	Dwellings without basements	Dwellings with basements	Small commercial buildings	Local roads and streets
Manzanola: 51, 52, 53	Moderate: too clayey.	Severe: shrink-swell.	Severe: shrink-swell.	Severe: shrink-swell.	Severe: shrink-swell, low strength.
Midway: 54	Severe: too clayey, depth to rock.	Severe: shrink-swell, low strength.	Severe: shrink-swell, low strength, depth to rock.	Severe: slope, shrink-swell, low strength.	Severe: shrink-swell, low strength.
Nederland: 55	Severe: small stones, slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.
Nelson: [1]56: Nelson part	Severe: depth to rock.	Moderate: depth to rock, low strength.	Severe: depth to rock.	Moderate: slope, depth to rock, low strength.	Moderate: depth to rock, low strength.
Tassel part	Moderate: depth to rock.	Moderate: depth to rock.	Moderate: depth to rock.	Severe: slope.	Moderate: depth to rock.
Neville: 57	Slight	Moderate: low strength, shrink-swell.	Moderate: low strength, shrink-swell.	Moderate: slope, low strength, shrink-swell.	Severe: frost action.
[1]58: Neville part	Slight	Moderate: low strength, shrink-swell.	Moderate: low strength, shrink-swell.	Moderate: slope, low strength, shrink-swell.	Severe: frost action.
Rednun part	Moderate: too clayey.	Severe: shrink-swell.	Severe: shrink-swell.	Severe: shrink-swell.	Severe: shrink-swell, low strength.
Nunn: 59	Moderate: too clayey.	Severe: shrink-swell, low strength.	Severe: shrink-swell, low strength.	Severe: shrink-swell, low strength.	Severe: shrink-swell, low strength.
Olney: 60	Slight	Moderate: shrink-swell.	Moderate: shrink-swell.	Moderate: shrink-swell.	Moderate: low strength, frost action, shrink-swell.
61	Slight	Moderate: shrink-swell.	Moderate: shrink-swell.	Moderate: slope, shrink-swell.	Moderate: low strength, frost action, shrink-swell.
[1]62: Olney part	Slight	Moderate: shrink-swell.	Moderate: shrink-swell.	Moderate: shrink-swell.	Moderate: low strength, frost action, shrink-swell.
Vona part	Slight	Slight	Slight	Moderate: slope.	Moderate: low strength, frost action.

See footnote at end of table.

TABLE 8.--BUILDING SITE DEVELOPMENT--Continued

Soil name and map symbol	Shallow excavations	Dwellings without basements	Dwellings with basements	Small commercial buildings	Local roads and streets
Paunsaugunt:					
163:					
Paunsaugunt part	Severe: slope, depth to rock.	Severe: slope, depth to rock.	Severe: slope, depth to rock.	Severe: slope, depth to rock.	Severe: slope, depth to rock.
Rock outcrop part.					
Penrose:					
164:					
Penrose part	Severe: slope, depth to rock.	Severe: slope.	Severe: slope, depth to rock.	Severe: slope.	Severe: slope.
Manvel part	Moderate: slope.	Moderate: low strength, slope, shrink-swell.	Moderate: low strength, slope, shrink-swell.	Severe: slope.	Severe: frost action.
Perrypark:					
65	Slight	Moderate: low strength, shrink-swell.	Moderate: shrink-swell.	Moderate: slope, low strength, shrink-swell.	Moderate: frost action, low strength, shrink-swell.
Peyton:					
66	Slight	Moderate: low strength.	Slight	Moderate: low strength.	Moderate: frost action, low strength.
67	Slight	Moderate: low strength.	Slight	Moderate: slope, low strength.	Moderate: frost action, low strength.
168:					
Peyton part	Slight	Moderate: low strength.	Slight	Moderate: slope, low strength.	Moderate: frost action, low strength.
Pring part	Slight	Slight	Slight	Moderate: slope.	Moderate: frost action.
169:					
Peyton part	Moderate: slope.	Moderate: slope, low strength.	Moderate: slope.	Severe: slope.	Moderate: slope, frost action, low strength.
Pring part	Moderate: slope.	Moderate: slope.	Moderate: slope.	Severe: slope.	Moderate: slope, frost action.
Pits, gravel:					
70.					
Pring:					
71	Slight	Slight	Slight	Moderate: slope.	Moderate: frost action.
72	Moderate: slope.	Moderate: slope.	Moderate: slope.	Severe: slope.	Moderate: slope, frost action.
Razor:					
73	Moderate: depth to rock, too clayey.	Severe: shrink-swell, low strength.	Severe: shrink-swell, low strength.	Severe: shrink-swell, low strength.	Severe: shrink-swell, low strength.

See footnote at end of table.

TABLE 8.--BUILDING SITE DEVELOPMENT--Continued

Soil name and map symbol	Shallow excavations	Dwellings without basements	Dwellings with basements	Small commercial buildings	Local roads and streets
Razor:					
74	Moderate: too clayey, large stones.	Severe: shrink-swell.	Severe: shrink-swell.	Severe: shrink-swell, slope.	Severe: shrink-swell, low strength.
[1]75:					
Razor part	Moderate: depth to rock, too clayey.	Severe: shrink-swell, low strength.	Severe: shrink-swell, low strength.	Severe: slope, shrink-swell, low strength.	Severe: shrink-swell, low strength.
Midway part	Severe: too clayey, depth to rock.	Severe: shrink-swell, low strength.	Severe: shrink-swell, low strength, depth to rock.	Severe: slope, shrink-swell, low strength.	Severe: shrink-swell, low strength.
Rizozo:					
[1]76:					
Rizozo part	Severe: depth to rock, slope.	Severe: depth to rock, slope.	Severe: depth to rock, slope.	Severe: depth to rock, slope.	Severe: slope, depth to rock.
Neville part	Moderate: slope.	Moderate: slope, low strength, shrink-swell.	Moderate: slope, low strength, shrink-swell.	Severe: slope.	Severe: frost action.
Rock outcrop:					
[1]77:					
Rock outcrop part.					
Coldcreek part	Severe: slope, small stones, cutbanks cave.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.
Tolman part	Severe: slope, depth to rock.	Severe: slope, depth to rock.	Severe: slope, depth to rock.	Severe: slope, depth to rock.	Severe: slope, depth to rock.
Sampson:					
78	Slight	Moderate: low strength, shrink-swell.	Moderate: low strength, shrink-swell.	Moderate: low strength, shrink-swell.	Moderate: low strength, frost action, shrink-swell.
Satanta:					
79, 80	Slight	Moderate: shrink-swell, low strength.	Moderate: shrink-swell, low strength.	Moderate: shrink-swell, low strength.	Moderate: shrink-swell, low strength.
[1]81:					
Satanta part	Slight	Moderate: shrink-swell, low strength.	Moderate: shrink-swell, low strength.	Moderate: shrink-swell, low strength.	Moderate: shrink-swell, low strength.
Neville part	Slight	Moderate: low strength, shrink-swell.	Moderate: low strength, shrink-swell.	Moderate: slope, low strength, shrink-swell.	Severe: frost action.
Schamber:					
[1]82:					
Schamber part	Severe: slope, cutbanks cave.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.
Razor part	Moderate: depth to rock, too clayey.	Severe: shrink-swell, low strength.	Severe: shrink-swell, low strength.	Severe: slope, shrink-swell, low strength.	Severe: shrink-swell, low strength.

See footnote at end of table.

TABLE 8.--BUILDING SITE DEVELOPMENT--Continued

Soil name and map symbol	Shallow excavations	Dwellings without basements	Dwellings with basements	Small commercial buildings	Local roads and streets
Stapleton:					
83	Slight	Slight	Slight	Moderate: slope.	Moderate: frost action.
84	Moderate: slope.	Moderate: slope.	Moderate: slope.	Severe: slope.	Moderate: slope, frost action.
[1]85:					
Stapleton part	Moderate: slope.	Moderate: slope.	Moderate: slope.	Severe: slope.	Moderate: slope, frost action.
Bernal part	Severe: depth to rock.	Severe: depth to rock.	Severe: depth to rock.	Severe: depth to rock.	Severe: depth to rock, low strength.
Stoneham:					
86	Slight	Slight	Slight	Moderate: slope.	Moderate: low strength, frost action.
87	Moderate: slope.	Moderate: slope.	Moderate: slope.	Severe: slope.	Moderate: slope, low strength, frost action.
Stroupe:					
[1]88:					
Stroupe part	Severe: depth to rock, large stones, slope.	Severe: slope.	Severe: depth to rock, slope.	Severe: slope.	Severe: slope.
Travessilla part	Severe: depth to rock, slope.	Severe: depth to rock, slope.	Severe: depth to rock, slope.	Severe: depth to rock, slope.	Severe: depth to rock, slope.
Rock outcrop part.					
Tassel:					
89	Moderate: depth to rock.	Moderate: depth to rock.	Moderate: depth to rock.	Severe: slope.	Moderate: depth to rock.
Terry:					
90	Severe: depth to rock.	Moderate: depth to rock.	Severe: depth to rock.	Moderate: depth to rock, slope.	Moderate: depth to rock, frost action.
[1]91:					
Terry part	Severe: depth to rock.	Moderate: depth to rock, slope.	Severe: depth to rock.	Severe: slope.	Moderate: depth to rock, slope, frost action.
Razor part	Moderate: depth to rock, too clayey.	Severe: shrink-swell, low strength.	Severe: shrink-swell, low strength.	Severe: shrink-swell, low strength.	Severe: shrink-swell, low strength.
Tomah:					
[1]92:					
Tomah part	Slight	Slight	Slight	Moderate: slope.	Moderate: frost action.
Crowfoot part	Slight	Slight	Slight	Moderate: slope.	Moderate: frost action, low strength.

See footnote at end of table.

TABLE 8.--BUILDING SITE DEVELOPMENT--Continued

Soil name and map symbol	Shallow excavations	Dwellings without basements	Dwellings with basements	Small commercial buildings	Local roads and streets
Tomah:					
193:					
Tomah part	Moderate: slope.	Moderate: slope.	Moderate: slope.	Severe: slope.	Moderate: slope, frost action.
Crowfoot part	Moderate: slope.	Moderate: slope.	Moderate: slope.	Severe: slope.	Moderate: slope, low strength, frost action.
Travessilla:					
194:					
Travessilla part	Severe: depth to rock, slope.	Severe: depth to rock, slope.	Severe: depth to rock, slope.	Severe: depth to rock, slope.	Severe: depth to rock, slope.
Rock outcrop part.					
Truckton:					
95, 97	Slight	Slight	Slight	Moderate: slope.	Moderate: frost action.
96	Slight	Slight	Slight	Slight	Moderate: frost action.
198:					
Truckton part	Moderate: slope.	Moderate: slope.	Moderate: slope.	Severe: slope.	Moderate: slope, frost action.
Blakeland part	Moderate: slope.	Moderate: slope.	Moderate: slope.	Severe: slope.	Moderate: slope.
199:					
Truckton part	Moderate: slope.	Moderate: slope.	Moderate: slope.	Severe: slope.	Moderate: slope, frost action.
Bresser part	Slight	Slight	Slight	Moderate: slope.	Slight.
1100:					
Truckton part	Slight	Slight	Slight	Moderate: slope.	Moderate: frost action.
Bresser part	Slight	Slight	Slight	Moderate: slope.	Slight.
Ustic Torrifluvents:					
101	Severe: floods.	Severe: floods.	Severe: floods.	Severe: floods.	Severe: floods.
Valent:					
102	Severe: cutbanks cave.	Slight	Slight	Moderate: slope.	Slight.
103	Severe: cutbanks cave.	Moderate: slope.	Moderate: slope.	Severe: slope.	Moderate: slope.
Vona:					
104	Slight	Slight	Slight	Slight	Moderate: low strength, frost action.
105	Slight	Slight	Slight	Moderate: slope.	Moderate: low strength, frost action.

See footnote at end of table.

TABLE 8.--BUILDING SITE DEVELOPMENT--Continued

Soil name and map symbol	Shallow excavations	Dwellings without basements	Dwellings with basements	Small commercial buildings	Local roads and streets
Wigton:					
106	Severe: cutbanks cave.	Slight	Slight	Moderate: slope.	Slight.
Wiley:					
107	Slight	Moderate: low strength.	Moderate: low strength, shrink-swell.	Moderate: low strength.	Moderate: low strength, shrink-swell.
108	Slight	Moderate: low strength.	Moderate: low strength, shrink-swell.	Moderate: low strength, slope.	Moderate: low strength, shrink-swell.
Yoder:					
109	Moderate: small stones, cutbanks cave.	Slight	Slight	Moderate: slope.	Slight.
110	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.

[1]This map unit is made up of two or more dominant kinds of soil. See map unit description for the composition and behavior characteristics of the map unit.

TABLE 9.--SANITARY FACILITIES

["Depth to rock" and some of the other terms that describe restrictive soil features are defined in the Glossary. See text for definitions of "slight," "moderate," "good," "fair," and other terms used to rate soils. Absence of an entry means soil was not rated]

Soil name and map symbol	Septic tank absorption fields	Sewage lagoon areas	Trench sanitary landfill	Daily cover for landfill
Alamosa:				
1	Severe: wetness, floods.	Severe: wetness, floods, excess humus.	Severe: wetness, floods.	Poor: wetness.
Ascalon:				
2, 3	Slight	Severe: seepage.	Severe: seepage.	Good.
Badland:				
4.				
Bijou:				
5	Slight	Severe: seepage.	Severe: seepage.	Fair: too sandy.
6, 7	Slight	Severe: seepage.	Severe: seepage.	Good.
Blakeland:				
8	Slight	Severe: seepage.	Severe: seepage.	Fair: too sandy.
9:				
Blakeland part	Slight	Severe: seepage.	Severe: seepage.	Fair: too sandy.
Fluvaquentic Haplaquolls part	Severe: wetness, floods.	Severe: wetness, floods.	Severe: wetness, floods.	Fair: wetness.
Blendon:				
10	Slight	Severe: seepage.	Severe: seepage.	Good.
Bresser:				
11, 12	Slight	Severe: seepage.	Severe: seepage.	Good.
13	Slight	Severe: seepage, slope.	Severe: seepage.	Good.
Brussett:				
14, 15	Moderate: percs slowly.	Moderate: slope, seepage.	Moderate: too clayey.	Fair: too clayey.
Chaseville:				
16	Slight	Severe: seepage.	Severe: seepage.	Poor: small stones.
17	Severe: slope.	Severe: seepage, slope.	Severe: seepage.	Poor: small stones, slope.
18:				
Chaseville part	Severe: slope.	Severe: seepage, slope.	Severe: seepage, slope.	Poor: small stones, slope.

See footnote at end of table.

TABLE 9.--SANITARY FACILITIES--Continued

Soil name and map symbol	Septic tank absorption fields	Sewage lagoon areas	Trench sanitary landfill	Daily cover for landfill
Chaseville:				
Midway part------	Severe: slope, percs slowly, depth to rock.	Severe: depth to rock, slope.	Severe: depth to rock, too clayey.	Poor: slope, too clayey, thin layer.
Columbine:				
19----------	Slight----------	Severe: seepage.	Severe: seepage, too sandy.	Poor: too sandy, small stones.
Connerton:				
120:				
Connerton part---	Severe: slope.	Severe: slope.	Moderate: slope.	Poor: slope.
Rock outcrop part.				
Cruckton:				
21----------	Slight----------	Severe: seepage.	Severe: seepage.	Good.
Cushman:				
22----------	Severe: depth to rock.	Severe: depth to rock.	Severe: depth to rock.	Poor: area reclaim.
23----------	Severe: depth to rock.	Severe: depth to rock, slope.	Severe: depth to rock.	Poor: area reclaim.
124:				
Cushman part-----	Severe: depth to rock.	Severe: depth to rock, slope.	Severe: depth to rock.	Poor: area reclaim.
Kutch part-------	Severe: depth to rock, percs slowly.	Severe: depth to rock, slope.	Severe: depth to rock, too clayey.	Poor: too clayey.
Elbeth:				
25----------	Moderate: percs slowly.	Moderate: seepage, slope.	Slight----------	Good.
26----------	Moderate: percs slowly, slope.	Severe: seepage, slope.	Slight----------	Fair: slope.
127:				
Elbeth part------	Moderate: percs slowly, slope.	Severe: seepage, slope.	Slight----------	Fair: slope.
Pring part-------	Severe: slope.	Severe: seepage, slope.	Severe: seepage.	Poor: slope.
Ellicott:				
28----------	Severe: floods.	Severe: floods, seepage.	Severe: floods, seepage.	Poor: too sandy, seepage.
Fluvaquentic Haplaquolls:				
29----------	Severe: wetness, floods.	Severe: wetness, floods.	Severe: wetness, floods.	Poor: wetness.

See footnote at end of table.

TABLE 9.--SANITARY FACILITIES--Continued

Soil name and map symbol	Septic tank absorption fields	Sewage lagoon areas	Trench sanitary landfill	Daily cover for landfill
Fort Collins:				
30	Moderate: percs slowly.	Moderate: seepage.	Slight	Good.
31	Moderate: percs slowly.	Moderate: seepage, slope.	Slight	Good.
Fortwingate:				
[1]32:				
Fortwingate part	Severe: depth to rock, percs slowly, slope.	Severe: depth to rock, slope.	Severe: depth to rock, slope.	Poor: slope, area reclaim.
Rock outcrop part.				
Heldt:				
33	Severe: percs slowly.	Slight	Severe: too clayey.	Poor: too clayey.
Holderness:				
[1]34, 35	Severe: percs slowly.	Moderate: excess humus, slope.	Moderate: too clayey.	Fair: too clayey.
36	Severe: percs slowly.	Severe: slope.	Moderate: slope, too clayey.	Fair: too clayey, slope.
Jarre:				
37	Slight	Severe: seepage.	Severe: seepage.	Good.
[1]38:				
Jarre part	Moderate: slope.	Severe: slope, seepage.	Severe: seepage.	Fair: slope.
Tecolote part	Severe: slope.	Severe: slope, small stones, seepage.	Severe: small stones, seepage, slope.	Poor: slope, small stones.
Keith:				
39	Slight	Moderate: seepage.	Slight	Good.
Kettle:				
40	Slight	Severe: seepage.	Severe: seepage.	Fair: too sandy.
41	Severe: slope.	Severe: seepage, slope.	Severe: seepage.	Poor: slope.
[1]42:				
Kettle part	Severe: slope.	Severe: seepage, slope.	Severe: seepage.	Poor: slope.
Rock outcrop part.				
Kim:				
43	Slight	Moderate: seepage, slope.	Slight	Good.

See footnote at end of table.

TABLE 9.--SANITARY FACILITIES--Continued

Soil name and map symbol	Septic tank absorption fields	Sewage lagoon areas	Trench sanitary landfill	Daily cover for landfill
Kutch:				
44	Severe: depth to rock, percs slowly.	Severe: depth to rock.	Severe: depth to rock, too clayey.	Poor: too clayey, area reclaim.
45	Severe: depth to rock, percs slowly.	Severe: depth to rock, slope.	Severe: depth to rock, too clayey.	Poor: too clayey, area reclaim.
Kutler:				
[1]46:				
Kutler part	Severe: slope, depth to rock.	Severe: slope, seepage, depth to rock.	Severe: seepage, slope, depth to rock.	Poor: small stones, slope, area reclaim.
Broadmoor part	Severe: depth to rock, slope.	Severe: depth to rock, slope, seepage.	Severe: depth to rock, slope, seepage.	Poor: slope, small stones, area reclaim.
Rock outcrop part.				
Limon:				
47	Severe: floods, percs slowly.	Severe: floods.	Severe: floods, too clayey.	Poor: too clayey.
Louviers:				
48	Severe: percs slowly, depth to rock.	Severe: depth to rock, slope.	Severe: too clayey, depth to rock.	Poor: too clayey, thin layer, area reclaim.
49	Severe: percs slowly, depth to rock, slope.	Severe: depth to rock, slope.	Severe: too clayey, depth to rock.	Poor: slope, too clayey, thin layer.
Manvel:				
50	Moderate: percs slowly.	Moderate: seepage, slope.	Slight	Fair: too clayey.
Manzanola:				
51	Severe: percs slowly.	Slight	Moderate: too clayey.	Fair: too clayey.
52, 53	Severe: percs slowly.	Moderate: slope.	Moderate: too clayey.	Fair: too clayey.
Midway:				
54	Severe: percs slowly, depth to rock.	Severe: depth to rock, slope.	Severe: depth to rock, too clayey.	Poor: too clayey, thin layer, area reclaim.
Nederland:				
55	Severe: slope.	Severe: small stones, slope, seepage.	Severe: seepage.	Poor: small stones, slope.
Nelson:				
[1]56:				
Nelson part	Severe: depth to rock.	Severe: depth to rock, slope, seepage.	Severe: depth to rock, seepage.	Fair: thin layer, area reclaim.

See footnote at end of table.

TABLE 9.--SANITARY FACILITIES--Continued

Soil name and map symbol	Septic tank absorption fields	Sewage lagoon areas	Trench sanitary landfill	Daily cover for landfill
Nelson:				
Tassel part------	Severe: depth to rock.	Severe: depth to rock, seepage, slope.	Severe: depth to rock, seepage.	Poor: thin layer, area reclaim.
Neville:				
57----------	Moderate: percs slowly.	Moderate: slope, seepage.	Slight----------	Good.
[1]58:				
Neville part-----	Moderate: percs slowly.	Moderate: slope, seepage.	Slight----------	Good.
Rednun part------	Severe: percs slowly.	Moderate: slope.	Moderate: too clayey.	Fair: too clayey.
Nunn:				
59----------	Severe: percs slowly.	Moderate: excess humus.	Slight----------	Fair: too clayey.
Olney:				
60, 61----------	Slight----------	Moderate: seepage.	Slight----------	Good.
[1]62:				
Olney part-------	Slight----------	Moderate: seepage.	Slight----------	Good.
Vona part--------	Slight----------	Severe: seepage.	Severe: seepage.	Good.
Paunsaugunt:				
[1]63:				
Paunsaugunt part-	Severe: slope, depth to rock.	Severe: slope, depth to rock, seepage.	Severe: slope, depth to rock.	Poor: slope, thin layer, small stones.
Rock outcrop part.				
Penrose:				
[1]64:				
Penrose part-----	Severe: depth to rock, slope.	Severe: depth to rock, slope.	Severe: depth to rock, slope.	Poor: thin layer, slope, area reclaim.
Manvel part------	Moderate: percs slowly, slope.	Severe: slope.	Slight----------	Fair: too clayey, slope, area reclaim.
Perrypark:				
65----------	Slight----------	Severe: seepage.	Severe: seepage.	Good.
Peyton:				
66----------	Moderate: percs slowly.	Moderate: slope, seepage, excess humus.	Slight----------	Good.
67----------	Moderate: percs slowly.	Severe: slope.	Slight----------	Good.

See footnote at end of table.

TABLE 9.--SANITARY FACILITIES--Continued

Soil name and map symbol	Septic tank absorption fields	Sewage lagoon areas	Trench sanitary landfill	Daily cover for landfill
Peyton:				
168:				
Peyton part	Moderate: perces slowly.	Moderate: slope, seepage, excess humus.	Slight	Good.
Pring part	Slight	Severe: seepage.	Severe: seepage.	Good.
169:				
Peyton part	Moderate: perces slowly.	Severe: slope.	Slight	Fair: slope.
Pring part	Moderate: slope.	Severe: seepage, slope.	Severe: seepage.	Fair: slope.
Pits, gravel: 70.				
Pring:				
71	Slight	Severe: seepage.	Severe: seepage.	Good.
72	Moderate: slope.	Severe: seepage, slope.	Severe: seepage.	Fair: slope.
Razor:				
73	Severe: perces slowly, depth to rock.	Severe: depth to rock, seepage.	Severe: depth to rock.	Fair: too clayey, thin layer, area reclaim.
74	Severe: depth to rock, perces slowly.	Severe: slope, depth to rock.	Severe: depth to rock.	Fair: too clayey, large stones, area reclaim.
175:				
Razor part	Severe: perces slowly, depth to rock.	Severe: slope, depth to rock, seepage.	Severe: depth to rock.	Fair: too clayey, thin layer, area reclaim.
Midway part	Severe: perces slowly, depth to rock.	Severe: depth to rock, slope.	Severe: depth to rock, too clayey.	Poor: too clayey, thin layer, area reclaim.
Rizozo:				
176:				
Rizozo part	Severe: depth to rock, slope.	Severe: depth to rock, slope, seepage.	Severe: depth to rock, seepage.	Poor: thin layer, slope, area reclaim.
Neville part	Moderate: slope, perces slowly.	Severe: slope.	Slight	Fair: slope.
Rock outcrop:				
177:				
Rock outcrop part.				
Coldcreek part	Severe: slope.	Severe: slope, small stones.	Severe: slope, depth to rock.	Poor: slope, small stones.

See footnote at end of table.

TABLE 9.--SANITARY FACILITIES--Continued

Soil name and map symbol	Septic tank absorption fields	Sewage lagoon areas	Trench sanitary landfill	Daily cover for landfill
Rock outcrop: Tolman part	Severe: slope, depth to rock.	Severe: slope, depth to rock.	Severe: slope, depth to rock.	Poor: slope, thin layer, area reclaim.
Sampson: 78	Moderate: percs slowly.	Moderate: seepage, excess humus.	Slight	Good.
Satanta: 79	Moderate: percs slowly.	Moderate: seepage.	Slight	Good.
80	Moderate: percs slowly.	Moderate: seepage, slope.	Slight	Good.
[1]81: Satanta part	Moderate: percs slowly.	Moderate: seepage, slope.	Slight	Good.
Neville part	Moderate: percs slowly.	Moderate: slope, seepage.	Slight	Good.
Schamber: [1]82: Schamber part	Severe: slope.	Severe: slope, seepage.	Severe: slope, seepage, too sandy.	Poor: slope, thin layer, area reclaim.
Razor part	Severe: percs slowly, depth to rock.	Severe: slope, depth to rock, seepage.	Severe: depth to rock.	Fair: too clayey, thin layer, area reclaim.
Stapleton: 83	Slight	Severe: seepage.	Severe: seepage.	Good.
84	Moderate: slope.	Severe: seepage, slope.	Severe: seepage.	Fair: slope.
[1]85: Stapleton part	Moderate: slope.	Severe: seepage, slope.	Severe: seepage.	Fair: slope.
Bernal part	Severe: depth to rock.	Severe: depth to rock, slope.	Severe: depth to rock.	Poor: thin layer, area reclaim.
Stoneham: 86	Moderate: percs slowly.	Moderate: seepage, slope.	Slight	Good.
87	Moderate: slope, percs slowly.	Severe: slope.	Slight	Fair: slope.
Stroupe: [1]88: Stroupe part	Severe: depth to rock, percs slowly, slope.	Severe: depth to rock, large stones, slope.	Severe: depth to rock, large stones, slope.	Poor: large stones, slope, area reclaim.

See footnote at end of table.

TABLE 9.--SANITARY FACILITIES--Continued

Soil name and map symbol	Septic tank absorption fields	Sewage lagoon areas	Trench sanitary landfill	Daily cover for landfill
Stroupe:				
Travessilla part-	Severe: depth to rock, slope.	Severe: depth to rock, slope.	Severe: depth to rock, slope.	Poor: slope, thin layer, area reclaim.
Rock outcrop part.				
Tassel:				
89	Severe: depth to rock.	Severe: depth to rock, seepage, slope.	Severe: depth to rock, seepage.	Poor: thin layer, area reclaim.
Terry:				
90	Severe: depth to rock.	Severe: depth to rock, seepage.	Severe: depth to rock.	Fair: thin layer, area reclaim.
[1]91:				
Terry part	Severe: depth to rock.	Severe: depth to rock, seepage, slope.	Severe: depth to rock.	Fair: thin layer, slope, area reclaim.
Razor part	Severe: percs slowly, depth to rock.	Severe: depth to rock, seepage.	Severe: depth to rock.	Fair: too clayey, thin layer, area reclaim.
Tomah:				
[1]92:				
Tomah part	Moderate: percs slowly.	Moderate: seepage, slope.	Severe: seepage.	Good.
Crowfoot part	Slight	Severe: seepage.	Severe: seepage.	Good.
[1]93:				
Tomah part	Moderate: slope, percs slowly.	Severe: slope, seepage.	Severe: seepage.	Fair: slope.
Crowfoot part	Moderate: slope.	Severe: seepage, slope.	Severe: seepage.	Fair: slope.
Travessilla:				
[1]94:				
Travessilla part-	Severe: depth to rock, slope.	Severe: depth to rock, slope.	Severe: depth to rock, slope.	Poor: slope, thin layer, area reclaim.
Rock outcrop part.				
Truckton:				
95, 96, 97	Slight	Severe: seepage.	Severe: seepage.	Good.
[1]98:				
Truckton part	Moderate: slope.	Severe: seepage, slope.	Severe: seepage.	Fair: slope.
Blakeland part	Moderate: slope.	Severe: seepage, slope.	Severe: seepage.	Fair: too sandy.

See footnote at end of table.

TABLE 9.--SANITARY FACILITIES--Continued

Soil name and map symbol	Septic tank absorption fields	Sewage lagoon areas	Trench sanitary landfill	Daily cover for landfill
Truckton:				
[1]99:				
Truckton part	Moderate: slope.	Severe: seepage, slope.	Severe: seepage.	Fair: slope.
Bresser part	Slight	Severe: seepage, slope.	Severe: seepage.	Good.
[1]100:				
Truckton part	Slight	Severe: seepage.	Severe: seepage.	Good.
Bresser part	Slight	Severe: seepage.	Severe: seepage.	Good.
Ustic Torrifluvents:				
101	Severe: floods.	Severe: floods.	Severe: floods.	
Valent:				
102	Slight	Severe: seepage.	Severe: too sandy, seepage.	Poor: too sandy.
103	Moderate: slope.	Severe: seepage, slope.	Severe: too sandy, seepage.	Poor: too sandy.
Vona:				
104, 105	Slight	Severe: seepage.	Severe: seepage.	Good.
Wigton:				
106	Slight	Severe: seepage.	Severe: seepage.	Fair: too sandy.
Wiley:				
107, 108	Moderate: percs slowly.	Moderate: seepage, slope.	Slight	Good.
Yoder:				
109	Slight	Severe: seepage.	Severe: seepage.	Fair: small stones.
110	Severe: slope.	Severe: slope, seepage.	Severe: slope, seepage.	Poor: slope.

[1]This map unit is made up of two or more dominant kinds of soil. See map unit description for the composition and behavior characteristics of the map unit.

TABLE 10.--CONSTRUCTION MATERIALS

["Shrink-swell" and some of the other terms that describe restrictive soil features are defined in the Glossary. See text for definitions of "good," "fair," "poor," and "unsuited." Absence of an entry means soil was not rated]

Soil name and map symbol	Roadfill	Sand	Gravel	Topsoil
Alamosa:				
1	Poor: wetness, frost action.	Unsuited	Unsuited	Poor: wetness.
Ascalon:				
2, 3	Fair: low strength, frost action, shrink-swell.	Unsuited	Unsuited	Good.
Badland:				
4.				
Bijou:				
5	Good	Poor: excess fines.	Unsuited	Poor: too sandy.
6, 7	Good	Poor: excess fines.	Unsuited	Good.
Blakeland:				
8	Good	Poor: excess fines.	Unsuited	Poor: too sandy.
[1]g:				
Blakeland part	Good	Poor: excess fines.	Unsuited	Poor: too sandy.
Fluvaquentic Haplaquolls part	Poor: frost action.	---	---	---
Blendon:				
10	Good	Fair: excess fines.	Unsuited	Good.
Bresser:				
11, 12, 13	Good	Poor: excess fines.	Unsuited	Fair: thin layer.
Brussett:				
14, 15	Fair: low strength, frost action.	Unsuited	Unsuited	Fair: thin layer.
Chaseville:				
16	Good	Fair: excess fines.	Fair: excess fines.	Poor: small stones.
17	Fair: slope.	Fair: excess fines.	Fair: excess fines.	Poor: small stones, slope.
[1]18:				
Chaseville part	Poor: slope.	Fair: excess fines.	Fair: excess fines.	Poor: small stones, slope.
Midway part	Poor: shrink-swell, low strength, thin layer.	Unsuited	Unsuited	Poor: thin layer, slope.

See footnote at end of table.

TABLE 10.--CONSTRUCTION MATERIALS--Continued

Soil name and map symbol	Roadfill	Sand	Gravel	Topsoil
Columbine: 19	Good	Fair: excess fines.	Fair: excess fines.	Poor: too sandy, small stones.
Connerton: [1]20: Connerton part	Poor: low strength, frost action.	Unsuited	Unsuited	Poor: slope.
Rock outcrop part.				
Cruckton: 21	Fair: frost action, low strength.	Poor: excess fines.	Unsuited	Good.
Cushman: 22	Poor: area reclaim, thin layer.	Unsuited	Unsuited	Fair: thin layer.
23	Poor: area reclaim, thin layer.	Unsuited	Unsuited	Fair: thin layer, slope.
[1]24: Cushman part	Poor: area reclaim, thin layer.	Unsuited	Unsuited	Fair: thin layer.
Kutch part	Poor: low strength, shrink-swell, thin layer.	Unsuited	Unsuited	Poor: thin layer.
Elbeth: 25	Fair: shrink-swell, low strength, frost action.	Unsuited	Unsuited	Good.
26	Fair: shrink-swell, low strength, frost action.	Unsuited	Unsuited	Fair: slope.
[1]27: Elbeth part	Fair: shrink-swell, low strength, frost action.	Unsuited	Unsuited	Fair: slope.
Pring part	Fair: slope, frost action.	Poor: excess fines.	Unsuited	Poor: slope, small stones.
Ellicott: 28	Good	Fair: excess fines.	Unsuited	Poor: too sandy.
Fluvaquentic Haplaquolls: 29	Poor: frost action.	---	---	Poor: wetness.
Fort Collins: 30, 31	Fair: low strength, frost action.	Unsuited	Unsuited	Good.

See footnote at end of table.

TABLE 10.--CONSTRUCTION MATERIALS--Continued

Soil name and map symbol	Roadfill	Sand	Gravel	Topsoil
Fortwingate:				
[1]32:				
Fortwingate part	Poor: low strength, slope, thin layer.	Unsuited	Unsuited	Poor: slope.
Rock outcrop part.				
Heldt:				
33	Poor: shrink-swell, low strength.	Unsuited	Unsuited	Poor: too clayey.
Holderness:				
34, 35	Poor: shrink-swell, low strength.	Unsuited	Unsuited	Fair: thin layer.
36	Poor: shrink-swell, low strength.	Unsuited	Unsuited	Fair: thin layer, slope.
Jarre:				
37	Fair: frost action, shrink-swell, low strength.	Unsuited	Poor: excess fines.	Poor: small stones.
[1]38:				
Jarre part	Fair: frost action, shrink-swell, low strength.	Poor: excess fines.	Poor: excess fines.	Poor: small stones.
Tecolote part	Poor: slope.	Unsuited	Unsuited	Poor: slope, small stones, large stones.
Keith:				
39	Poor: frost action.	Unsuited	Unsuited	Good.
Kettle:				
40	Fair: frost action.	Poor: excess fines.	Unsuited	Poor: too sandy.
41	Fair: slope, frost action.	Poor: excess fines.	Unsuited	Poor: too sandy, slope.
[1]42:				
Kettle part	Fair: slope, frost action.	Poor: excess fines.	Unsuited	Poor: too sandy, slope.
Rock outcrop part.				
Kim:				
43	Fair: low strength, frost action.	Unsuited	Unsuited	Good.
Kutch:				
44, 45	Poor: low strength, shrink-swell, thin layer.	Unsuited	Unsuited	Poor: thin layer.

See footnote at end of table.

TABLE 10.--CONSTRUCTION MATERIALS--Continued

Soil name and map symbol	Roadfill	Sand	Gravel	Topsoil
Kutler:				
[1]46:				
Kutler part	Poor: slope, thin layer, area reclaim.	Unsuited	Poor: excess fines.	Poor: small stones, slope, area reclaim.
Broadmoor part	Poor: thin layer, slope, area reclaim.	Unsuited	Poor: excess fines.	Poor: slope, small stones, area reclaim.
Rock outcrop part.				
Limon:				
47	Poor: shrink-swell, low strength.	Unsuited	Unsuited	Poor: too clayey.
Louviers:				
48	Poor: low strength, shrink-swell, thin layer.	Unsuited	Unsuited	Poor: too clayey, area reclaim.
49	Poor: low strength, shrink-swell, thin layer.	Unsuited	Unsuited	Poor: too clayey, small stones, slope.
Manvel:				
50	Poor: frost action.	Unsuited	Unsuited	Fair: excess lime, area reclaim.
Manzanola:				
51, 52, 53	Poor: shrink-swell, low strength.	Unsuited	Unsuited	Fair: thin layer, too clayey.
Midway:				
54	Poor: shrink-swell, low strength, thin layer.	Unsuited	Unsuited	Poor: thin layer, slope.
Nederland:				
55	Fair: slope, frost action, low strength.	Unsuited	Unsuited	Poor: small stones, slope.
Nelson:				
[1]56:				
Nelson part	Poor: thin layer.	Unsuited	Unsuited	Good.
Tassel part	Poor: thin layer, area reclaim.	Unsuited	Unsuited	Poor: area reclaim.
Neville:				
57	Poor: frost action.	Unsuited	Unsuited	Fair: small stones.
[1]58:				
Neville part	Poor: frost action.	Unsuited	Unsuited	Fair: small stones.

See footnote at end of table.

TABLE 10.--CONSTRUCTION MATERIALS--Continued

Soil name and map symbol	Roadfill	Sand	Gravel	Topsoil
Neville:				
Rednun part	Poor: shrink-swell, low strength.	Unsuited	Unsuited	Poor: thin layer.
Nunn:				
59	Poor: shrink-swell, low strength.	Unsuited	Unsuited	Fair: thin layer, too clayey.
Olney:				
60, 61	Fair: low strength.	Poor: excess fines.	Unsuited	Good.
[1]62:				
Olney part	Fair: low strength.	Poor: excess fines.	Unsuited	Good.
Vona part	Fair: low strength.	Poor: excess fines.	Unsuited	Good.
Paunsaugunt:				
[1]63:				
Paunsaugunt part	Poor: slope.	Unsuited	Unsuited	Poor: slope, small stones.
Rock outcrop part.				
Penrose:				
[1]64:				
Penrose part	Poor: thin layer, slope.	Unsuited	Unsuited	Poor: area reclaim, thin layer, slope.
Manvel part	Fair: low strength, shrink-swell.	Unsuited	Unsuited	Fair: excess lime, area reclaim, slope.
Perrypark:				
65	Fair: frost action, low strength.	Poor: excess fines.	Unsuited	Fair: small stones.
Peyton:				
66, 67	Fair: frost action, low strength.	Poor: excess fines.	Unsuited	Poor: small stones.
[1]68:				
Peyton part	Fair: frost action, low strength.	Poor: excess fines.	Unsuited	Poor: small stones.
Pring part	Fair: frost action.	Poor: excess fines.	Unsuited	Poor: small stones.
[1]69:				
Peyton part	Fair: frost action, low strength.	Poor: excess fines.	Unsuited	Poor: small stones.
Pring part	Fair: frost action.	Poor: excess fines.	Unsuited	Poor: small stones.
Pits, gravel:				
70.				

See footnote at end of table.

TABLE 10.--CONSTRUCTION MATERIALS--Continued

Soil name and map symbol	Roadfill	Sand	Gravel	Topsoil
Pring:				
71, 72	Fair: frost action.	Poor: excess fines.	Unsuited	Poor: small stones.
Razor:				
73	Poor: shrink-swell, low strength, thin layer.	Unsuited	Unsuited	Fair: too clayey.
74	Poor: thin layer, low strength, shrink-swell.	Unsuited	Unsuited	Poor: large stones, area reclaim.
[1]75:				
Razor part	Poor: shrink-swell, low strength, thin layer.	Unsuited	Unsuited	Fair: slope, too clayey.
Midway part	Poor: shrink-swell, low strength, thin layer.	Unsuited	Unsuited	Poor: thin layer, slope.
Rizozo:				
[1]76:				
Rizozo part	Poor: thin layer, area reclaim.	Unsuited	Unsuited	Poor: area reclaim, slope.
Neville part	Poor: frost action.	Unsuited	Unsuited	Fair: slope, small stones.
Rock outcrop:				
[1]77:				
Rock outcrop part.				
Coldcreek part	Poor: slope.	Unsuited	Poor: excess fines.	Poor: small stones, slope.
Tolman part	Poor: slope, thin layer, area reclaim.	Unsuited	Unsuited	Poor: slope, thin layer, large stones.
Sampson:				
78	Fair: low strength, frost action.	Unsuited	Unsuited	Good.
Satanta:				
79, 80	Fair: shrink-swell, low strength.	Unsuited	Unsuited	Fair: thin layer.
[1]81:				
Satanta part	Fair: shrink-swell, low strength.	Unsuited	Unsuited	Fair: thin layer.
Neville part	Poor: frost action.	Unsuited	Unsuited	Fair: small stones.

See footnote at end of table.

TABLE 10.--CONSTRUCTION MATERIALS--Continued

Soil name and map symbol	Roadfill	Sand	Gravel	Topsoil
Schamber:				
[1]82:				
Schamber part	Poor: slope.	Poor: excess fines.	Poor: excess fines.	Poor: slope, thin layer, area reclaim.
Razor part	Poor: shrink-swell, low strength, thin layer.	Unsuited	Unsuited	Fair: slope, too clayey.
Stapleton:				
83	Fair: frost action.	Unsuited	Unsuited	Fair: small stones.
84	Fair: frost action.	Unsuited	Unsuited	Fair: slope, small stones.
[1]85:				
Stapleton part	Fair: frost action.	Unsuited	Unsuited	Fair: slope, small stones.
Bernal part	Poor: thin layer, area reclaim, low strength.	Unsuited	Unsuited	Poor: area reclaim, thin layer.
Stoneham:				
86	Fair: low strength, frost action.	Unsuited	Unsuited	Good.
87	Fair: low strength, frost action.	Unsuited	Unsuited	Fair: slope.
Stroupe:				
[1]88:				
Stroupe part	Poor: slope, thin layer.	Unsuited	Unsuited	Poor: large stones, slope, thin layer.
Travessilla part	Poor: slope, thin layer.	Unsuited	Unsuited	Poor: area reclaim, slope.
Rock outcrop part.				
Tassel:				
89	Poor: thin layer, area reclaim.	Unsuited	Unsuited	Poor: area reclaim.
Terry:				
90	Poor: thin layer.	Unsuited	Unsuited	Fair: small stones.
[1]91:				
Terry part	Poor: thin layer.	Unsuited	Unsuited	Fair: slope, small stones.
Razor part	Poor: shrink-swell, low strength, thin layer.	Unsuited	Unsuited	Fair: too clayey.

See footnote at end of table.

TABLE 10.--CONSTRUCTION MATERIALS--Continued

Soil name and map symbol	Roadfill	Sand	Gravel	Topsoil
Tomah:				
[1]92:				
Tomah part	Fair: frost action.	Poor: excess fines.	Unsuited	Fair: thin layer.
Crowfoot part	Fair: frost action, shrink-swell, low strength.	Unsuited	Unsuited	Fair: thin layer.
[1]93:				
Tomah part	Fair: frost action.	Poor: excess fines.	Unsuited	Fair: thin layer, slope.
Crowfoot part	Fair: frost action, shrink-swell, low strength.	Unsuited	Unsuited	Fair: thin layer, slope.
Travessilla:				
[1]94:				
Travessilla part	Poor: slope, thin layer.	Unsuited	Unsuited	Poor: area reclaim, slope.
Rock outcrop part.				
Truckton:				
95	Fair: frost action.	Poor: excess fines.	Unsuited	Poor: too sandy.
96, 97	Fair: frost action.	Poor: excess fines.	Unsuited	Good.
[1]98:				
Truckton part	Fair: frost action.	Poor: excess fines.	Unsuited	Fair: slope.
Blakeland part	Good	Poor: excess fines.	Unsuited	Poor: too sandy.
[1]99:				
Truckton part	Fair: frost action.	Poor: excess fines.	Unsuited	Fair: slope.
Bresser part	Good	Poor: excess fines.	Unsuited	Fair: thin layer.
[1]100:				
Truckton part	Fair: frost action.	Poor: excess fines.	Unsuited	Good.
Bresser part	Good	Poor: excess fines.	Unsuited	Fair: thin layer.
Ustic Torrifluvents:				
101	---	---	---	---
Valent:				
102, 103	Good	Fair: excess fines.	Unsuited	Poor: too sandy.
Vona:				
104, 105	Fair: low strength.	Poor: excess fines.	Unsuited	Good.
Wigton:				
106	Good	Fair: excess fines.	Unsuited	Poor: too sandy.

See footnote at end of table.

TABLE 10.--CONSTRUCTION MATERIALS--Continued

Soil name and map symbol	Roadfill	Sand	Gravel	Topsoil
Wiley:				
107, 108	Fair: low strength.	Unsuited	Unsuited	Good.
Yoder:				
109	Good	Fair: excess fines.	Fair: excess fines.	Poor: small stones, area reclaim.
110	Fair: slope.	Fair: excess fines.	Fair: excess fines.	Poor: slope, small stones, area reclaim.

[1]This map unit is made up of two or more dominant kinds of soil. See map unit description for the composition and behavior characteristics of the map unit.

TABLE 11.--WATER MANAGEMENT

["Seepage," and some of the other terms that describe restrictive soil features are defined in the Glossary. Absence of an entry means soil was not evaluated]

Soil name and map symbol	Pond reservoir areas	Embankments, dikes, and levees	Drainage	Irrigation	Terraces and diversions	Grassed waterways
Alamosa:						
1	Seepage, excess humus.	Low strength, compressible, piping.	Slope, floods, poor outlets.	Slope, wetness, floods.	Wetness, piping.	Wetness.
Ascalon:						
2	Seepage, slope.	Piping, low strength.	Slope	Slope, erodes easily.	Erodes easily, piping.	Erodes easily.
3	Seepage, slope.	Piping, low strength.	Slope	Slope, erodes easily.	Erodes easily, piping, slope.	Erodes easily, slope.
Badland:						
4.						
Bijou:						
5, 6, 7	Seepage, slope.	Piping	Slope	Slope, droughty, erodes easily.	Erodes easily, piping.	Erodes easily, droughty.
Blakeland:						
8	Seepage, slope.	Piping	Slope	Erodes easily, slope, droughty.	Erodes easily, piping.	Slope, erodes easily, droughty.
9:						
Blakeland part	Seepage, slope.	Piping	Slope	Erodes easily, slope, droughty.	Erodes easily, piping.	Slope, erodes easily, droughty.
Fluvaquentic Haplaquolls part	---	---	Wetness	Wetness	Wetness	Wetness.
Blendon:						
10	Seepage	Seepage, piping.	Not needed	Seepage	Not needed	Favorable.
Bresser:						
11	Seepage	Piping	Slope	Slope, erodes easily.	Erodes easily, piping.	Erodes easily.
12	Seepage, slope.	Piping	Slope	Slope, erodes easily.	Erodes easily, piping.	Slope, erodes easily.
13	Seepage, slope.	Piping	Slope	Slope, erodes easily.	Slope, erodes easily, piping.	Slope, erodes easily.
Brussett:						
14	Slope, seepage.	Low strength, hard to pack, piping.	Slope	Slope	Piping	Favorable.
15	Slope, seepage.	Low strength, hard to pack, piping.	Slope	Slope	Piping	Slope.
Chaseville:						
16	Seepage, slope.	Erodes easily, piping, seepage.	Cutbanks cave	Slope, droughty.	Erodes easily, piping.	Slope, erodes easily, droughty.
17	Seepage, slope.	Erodes easily, piping, seepage.	Slope, cutbanks cave.	Slope, droughty.	Slope, erodes easily, piping.	Slope, erodes easily, droughty.

See footnote at end of table.

TABLE 11.--WATER MANAGEMENT--Continued

Soil name and map symbol	Pond reservoir areas	Embankments, dikes, and levees	Drainage	Irrigation	Terraces and diversions	Grassed waterways
Chaseville:						
[1]18:						
Chaseville part	Seepage, slope.	Erodes easily, piping, seepage.	Slope, cutbanks cave.	Slope, droughty.	Slope, erodes easily, piping.	Slope, erodes easily, droughty.
Midway part	Slope, depth to rock, seepage.	Thin layer, shrink-swell, low strength.	Complex slope, depth to rock, excess salt.	Complex slope, rooting depth, excess salt.	Slope, depth to rock, poor outlets.	Slope, percs slowly, excess salt.
Columbine:						
19	Seepage	Seepage	Cutbanks cave	Droughty, erodes easily.	Erodes easily, piping, droughty.	Droughty.
Connerton:						
[1]20:						
Connerton part	Slope, seepage.	Low strength, shrink-swell.	Slope	Slope, erodes easily.	Slope, erodes easily.	Slope, erodes easily.
Rock outcrop part.						
Cruckton:						
21	Slope, seepage.	Erodes easily, low strength.	Slope	Slope, erodes easily.	Erodes easily	Slope, erodes easily.
Cushman:						
22	Depth to rock, slope, seepage.	Thin layer, low strength, piping.	Depth to rock, complex slope.	Rooting depth, complex slope.	Depth to rock	Rooting depth, erodes easily.
23	Depth to rock, slope, seepage.	Thin layer, low strength, piping.	Depth to rock, complex slope.	Rooting depth, complex slope.	Slope, depth to rock.	Rooting depth, slope, erodes easily.
[1]24:						
Cushman part	Depth to rock, slope, seepage.	Thin layer, low strength, piping.	Depth to rock, complex slope.	Rooting depth, complex slope.	Depth to rock	Rooting depth, slope, erodes easily.
Kutch part	Depth to rock, slope.	Thin layer, low strength, shrink-swell.	Depth to rock, percs slowly, slope.	Rooting depth, percs slowly, slope.	Depth to rock, percs slowly.	Rooting depth, percs slowly.
Elbeth:						
25	Seepage, slope.	Erodes easily, shrink-swell, low strength.	Slope, percs slowly.	Slope, erodes easily.	Erodes easily	Slope, erodes easily.
26	Seepage, slope.	Erodes easily, shrink-swell, low strength.	Slope, percs slowly.	Slope, erodes easily.	Slope, erodes easily.	Slope, erodes easily.
[1]27:						
Elbeth part	Seepage, slope.	Erodes easily, shrink-swell, low strength.	Slope, percs slowly.	Slope, erodes easily.	Slope, erodes easily.	Slope, erodes easily.
Pring part	Slope, seepage.	Piping	Slope	Slope, erodes easily.	Slope, erodes easily, piping.	Slope, erodes easily.
Ellicott:						
28	Seepage	Piping, seepage.	Floods, cutbanks cave.	Floods, droughty.	Erodes easily, piping.	Droughty, erodes easily.
Fluvaquentic Haplaquolls:						
29	---	---	Floods	Floods, wetness.	Wetness	Wetness.

See footnote at end of table.

TABLE 11.--WATER MANAGEMENT--Continued

Soil name and map symbol	Pond reservoir areas	Embankments, dikes, and levees	Drainage	Irrigation	Terraces and diversions	Grassed waterways
Fort Collins:						
30	Seepage	Low strength	Slope, percs slowly.	Slope	Favorable	Favorable.
31	Slope, seepage.	Low strength	Slope, percs slowly.	Slope	Favorable	Slope.
Fortwingate:						
[1]32:						
Fortwingate part	Depth to rock, slope.	Low strength, thin layer, shrink-swell.	Slope, percs slowly.	Slope, slow intake.	Depth to rock, slope.	Slope, droughty.
Rock outcrop part.						
Heldt:						
33	Favorable	Low strength, shrink-swell.	Percs slowly	Percs slowly, slow intake.	Percs slowly	Percs slowly.
Holderness:						
34	Slope, excess humus.	Shrink-swell, low strength, compressible.	Slope, percs slowly.	Slope, percs slowly.	Percs slowly	Favorable.
35	Slope, excess humus.	Shrink-swell, low strength, compressible.	Slope, percs slowly.	Slope, percs slowly.	Percs slowly	Slope.
36	Slope, excess humus.	Shrink-swell, low strength, compressible.	Slope, percs slowly.	Slope, percs slowly.	Slope, percs slowly.	Slope.
Jarre:						
37	Slope, seepage.	Shrink-swell, low strength.	Slope	Slope, erodes easily.	Erodes easily	Slope, erodes easily.
[1]38:						
Jarre part	Slope, seepage.	Shrink-swell, low strength.	Slope	Slope, erodes easily.	Slope, erodes easily.	Slope, erodes easily.
Tecolote part	Slope	Piping	Slope	Slope	Slope, piping.	Slope.
Keith:						
39	Seepage	Piping, erodes easily.	Not needed	Erodes easily, slope.	Erodes easily, slope.	Erodes easily, slope.
Kettle:						
40, 41	Seepage, slope.	Piping	Slope	Slope	Slope, erodes easily.	Slope, erodes easily.
[1]42:						
Kettle part	Seepage, slope.	Piping	Slope	Slope	Slope, erodes easily.	Slope, erodes easily.
Rock outcrop part.						
Kim:						
43	Seepage, slope.	Piping, low strength, hard to pack.	Slope	Slope	Slope, piping.	Slope.
Kutch:						
44	Depth to rock, slope.	Thin layer, low strength, shrink-swell.	Depth to rock, percs slowly, slope.	Rooting depth, percs slowly, slope.	Depth to rock, percs slowly.	Rooting depth, percs slowly.
45	Depth to rock, slope.	Thin layer, low strength, shrink-swell.	Depth to rock, percs slowly, slope.	Rooting depth, percs slowly, slope.	Depth to rock, percs slowly, slope.	Rooting depth, percs slowly, slope.

See footnote at end of table.

TABLE 11.--WATER MANAGEMENT--Continued

Soil name and map symbol	Pond reservoir areas	Embankments, dikes, and levees	Drainage	Irrigation	Terraces and diversions	Grassed waterways
Kutler:						
46:						
Kutler part	Seepage, slope.	Seepage, thin layer.	Slope	Slope	Slope, depth to rock.	Slope.
Broadmoor part	Slope, seepage, depth to rock.	Seepage, thin layer.	Slope	Slope	Slope, depth to rock.	Slope.
Rock outcrop part.						
Limon:						
47	Favorable	Hard to pack, compressible, low strength.	Slope, percs slowly.	Slope, percs slowly, floods.	Erodes easily, percs slowly.	Erodes easily, percs slowly.
Louviers:						
48	Slope, depth to rock.	Low strength, compressible, shrink-swell.	Slope, depth to rock.	Slope, droughty.	Slope, depth to rock.	Slope, rooting depth.
49	Depth to rock, slope.	Low strength, compressible, shrink-swell.	Slope, depth to rock.	Slope, droughty.	Depth to rock, slope.	Rooting depth, slope.
Manvel:						
50	Slope, seepage.	Erodes easily, low strength, piping.	Slope	Excess lime, slope, erodes easily.	Erodes easily	Erodes easily.
Manzanola:						
51	Favorable	Compressible, low strength, piping.	Percs slowly	Percs slowly	Percs slowly	Percs slowly.
52, 53	Slope	Compressible, low strength, piping.	Slope, percs slowly.	Percs slowly, slope.	Percs slowly	Percs slowly.
Midway:						
54	Slope, depth to rock, seepage.	Thin layer, shrink-swell, low strength.	Complex slope, depth to rock, excess salt.	Complex slope, rooting depth, excess salt.	Slope, depth to rock, poor outlets.	Slope, percs slowly, excess salt.
Nederland:						
55	Slope, seepage.	Low strength, piping.	Large stones, slope.	Large stones, slope, droughty.	Slope, piping.	Slope, droughty.
Nelson:						
56:						
Nelson part	Slope, depth to rock, seepage.	Piping, thin layer, low strength.	Slope, depth to rock.	Slope, rooting depth.	Slope, depth to rock.	Slope, rooting depth.
Tassel part	Depth to rock, slope.	Erodes easily, thin layer.	Not needed	Droughty, rooting depth.	Depth to rock, erodes easily.	Rooting depth, erodes easily.
Neville:						
57	Slope, seepage.	Piping, hard to pack, low strength.	Slope, percs slowly.	Slope, erodes easily.	Slope, erodes easily, piping.	Slope, erodes easily.
58:						
Neville part	Slope, seepage.	Piping, hard to pack, low strength.	Slope, percs slowly.	Slope, erodes easily.	Slope, erodes easily, piping.	Slope, erodes easily.
Rednun part	Slope	Shrink-swell, low strength, compressible.	Slope, percs slowly.	Slope, percs slowly.	Percs slowly	Slope, percs slowly.

See footnote at end of table.

TABLE 11.--WATER MANAGEMENT--Continued

Soil name and map symbol	Pond reservoir areas	Embankments, dikes, and levees	Drainage	Irrigation	Terraces and diversions	Grassed waterways
Nunn:						
59	Favorable	Compressible, shrink-swell, hard to pack.	Percs slowly, slope.	Percs slowly, slope.	Percs slowly	Favorable.
Olney:						
60, 61	Seepage, slope.	Piping, low strength.	Slope	Slope, erodes easily.	Erodes easily, piping.	Erodes easily.
[1]62:						
Olney part	Seepage, slope.	Piping, low strength.	Slope	Slope, erodes easily.	Erodes easily, piping.	Erodes easily.
Vona part	Seepage, slope.	Piping, erodes easily, seepage.	Slope	Slope, fast intake, seepage.	Piping, erodes easily.	Erodes easily.
Paunsaugunt:						
[1]63:						
Paunsaugunt part	Depth to rock, slope, seepage.	Thin layer, seepage, piping.	Depth to rock, slope.	Droughty, slope.	Slope, depth to rock.	Slope, rooting depth.
Rock outcrop part.						
Penrose:						
[1]64:						
Penrose part	Depth to rock, slope.	Thin layer, piping.	Depth to rock, slope.	Droughty, slope.	Depth to rock, slope.	Rooting depth, droughty, slope.
Manvel part	Slope, seepage.	Erodes easily, low strength, piping.	Slope	Excess lime, slope, erodes easily.	Erodes easily	Erodes easily.
Perrypark:						
65	Slope, seepage.	Piping, low strength.	Slope	Slope, erodes easily.	Slope, erodes easily, piping.	Slope, erodes easily.
Peyton:						
66	Slope, seepage.	Low strength	Slope	Slope, erodes easily.	Erodes easily	Slope, erodes easily.
67	Slope, seepage.	Low strength	Slope	Slope, erodes easily.	Erodes easily, slope.	Slope, erodes easily.
[1]68:						
Peyton part	Slope, seepage.	Low strength	Slope	Slope, erodes easily.	Erodes easily	Slope, erodes easily.
Pring part	Slope, seepage.	Piping	Slope	Slope, erodes easily.	Erodes easily, piping.	Slope, erodes easily.
[1]69:						
Peyton part	Slope, seepage.	Low strength	Slope	Slope, erodes easily.	Erodes easily, slope.	Slope, erodes easily.
Pring part	Slope, seepage.	Piping	Slope	Slope, erodes easily.	Slope, erodes easily, piping.	Slope, erodes easily.
Pits, gravel:						
70.						
Pring:						
71	Slope, seepage.	Piping	Slope	Slope, erodes easily.	Erodes easily, piping.	Slope, erodes easily.

See footnote at end of table.

TABLE 11.--WATER MANAGEMENT--Continued

Soil name and map symbol	Pond reservoir areas	Embankments, dikes, and levees	Drainage	Irrigation	Terraces and diversions	Grassed waterways
Pring:						
72	Slope, seepage.	Piping	Slope	Slope, erodes easily.	Slope, erodes easily, piping.	Slope, erodes easily.
Razor:						
73	Slope, depth to rock, seepage.	Thin layer, shrink-swell, low strength.	Slope, depth to rock, percs slowly.	Slope, rooting depth, seepage.	Percs slowly, rooting depth, depth to rock.	Slope, rooting depth, percs slowly.
74	Slope, depth to rock.	Shrink-swell, low strength, thin layer.	Slope, depth to rock, percs slowly.	Slope, slow intake.	Slope, percs slowly, large stones.	Slope, percs slowly, large stones.
[1]75:						
Razor part	Slope, depth to rock, seepage.	Thin layer, shrink-swell, low strength.	Slope, depth to rock, percs slowly.	Slope, rooting depth, seepage.	Slope, percs slowly, depth to rock.	Slope, rooting depth, percs slowly.
Midway part	Slope, depth to rock, seepage.	Thin layer, shrink-swell, low strength.	Complex slope, depth to rock, excess salt.	Complex slope, rooting depth, excess salt.	Slope, depth to rock, poor outlets.	Slope, percs slowly, excess salt.
Rizozo:						
[1]76:						
Rizozo part	Slope, depth to rock, seepage.	Thin layer	Slope, depth to rock.	Slope, droughty, rooting depth.	Slope, depth to rock.	Slope, rooting depth.
Neville part	Slope, seepage.	Piping, hard to pack, low strength.	Slope, percs slowly.	Slope, erodes easily.	Slope, erodes easily, piping.	Slope, erodes easily.
Rock outcrop:						
[1]77:						
Rock outcrop part.						
Coldcreek part-	Slope, depth to rock.	Piping, hard to pack.	Slope, depth to rock.	Slope	Slope, depth to rock, piping.	Slope.
Tolman part	Slope, depth to rock.	Thin layer, large stones, low strength.	Slope, depth to rock.	Slope, droughty.	Slope, depth to rock, large stones.	Slope, rooting depth, large stones.
Sampson:						
78	Seepage	Low strength, compressible, piping.	Slope	Slope	Piping	Favorable.
Satanta:						
79, 80	Seepage	Shrink-swell, low strength, piping.	Favorable	Favorable	Favorable	Favorable.
[1]81:						
Satanta part	Seepage	Shrink-swell, low strength, piping.	Favorable	Favorable	Favorable	Favorable.
Neville part	Slope, seepage.	Piping, hard to pack, low strength.	Slope, percs slowly.	Slope, erodes easily.	Erodes easily, piping.	Slope, erodes easily.
Schamber:						
[1]82:						
Schamber part	Slope, seepage.	Seepage	Not needed	Fast intake, droughty, slope.	Slope, too sandy, soil blowing.	Slope, droughty, erodes easily.

See footnote at end of table.

TABLE 11.--WATER MANAGEMENT--Continued

Soil name and map symbol	Pond reservoir areas	Embankments, dikes, and levees	Drainage	Irrigation	Terraces and diversions	Grassed waterways
Schamber:						
Razor part	Slope, depth to rock, seepage.	Thin layer, shrink-swell, low strength.	Slope, depth to rock, percs slowly.	Slope, rooting depth, seepage.	Slope, percs slowly, depth to rock.	Slope, rooting depth, percs slowly.
Stapleton:						
83	Seepage, slope.	Favorable	Slope	Slope, droughty, erodes easily.	Erodes easily	Slope, erodes easily, droughty.
84	Seepage, slope.	Favorable	Slope	Slope, droughty, erodes easily.	Slope, erodes easily.	Slope, erodes easily, droughty.
[1]85:						
Stapleton part	Seepage, slope.	Favorable	Slope	Slope, droughty, erodes easily.	Slope, erodes easily.	Slope, erodes easily, droughty.
Bernal part	Depth to rock, slope.	Thin layer, low strength.	Depth to rock, slope.	Slope, rooting depth.	Depth to rock	Slope, depth to rock.
Stoneham:						
86	Seepage, slope.	Low strength, compressible, piping.	Slope	Slope	Favorable	Favorable.
87	Seepage, slope.	Low strength, compressible, piping.	Slope	Slope	Slope	Slope.
Stroupe:						
[1]88:						
Stroupe part	Depth to rock, slope.	Thin layer, low strength, hard to pack.	Depth to rock, slope.	Slope, percs slowly.	Depth to rock, slope.	Slope.
Travessilla part	Depth to rock, slope.	Thin layer, piping, erodes easily.	Depth to rock, slope.	Slope, droughty.	Depth to rock, slope, erodes easily.	Slope, rooting depth.
Rock outcrop part.						
Tassel:						
89	Depth to rock, slope.	Erodes easily, thin layer.	Not needed	Droughty, rooting depth.	Depth to rock, erodes easily.	Rooting depth, erodes easily.
Terry:						
90	Slope, depth to rock, seepage.	Piping, thin layer.	Slope, rooting depth.	Slope, rooting depth.	Depth to rock, piping.	Slope, rooting depth.
[1]91:						
Terry part	Slope, depth to rock, seepage.	Piping, thin layer.	Slope, rooting depth.	Slope, rooting depth.	Slope, depth to rock, piping.	Slope, rooting depth.
Razor part	Slope, depth to rock, seepage.	Thin layer, shrink-swell, low strength.	Slope, depth to rock, percs slowly.	Slope, rooting depth, seepage.	Percs slowly, rooting depth, depth to rock.	Slope, rooting depth, percs slowly.
Tomah:						
[1]92:						
Tomah part	Seepage, slope.	Piping, erodes easily.	Slope, percs slowly.	Slope, erodes easily.	Erodes easily, too sandy.	Slope, erodes easily.
Crowfoot part	Seepage, slope.	Piping, low strength.	Slope	Slope, fast intake.	Erodes easily, piping.	Slope, erodes easily.

See footnote at end of table.

TABLE 11.--WATER MANAGEMENT--Continued

Soil name and map symbol	Pond reservoir areas	Embankments, dikes, and levees	Drainage	Irrigation	Terraces and diversions	Grassed waterways
Tomah:						
[1]93:						
Tomah part	Seepage, slope.	Piping, erodes easily.	Slope, percs slowly.	Slope, erodes easily.	Slope, erodes easily, too sandy.	Slope, erodes easily.
Crowfoot part	Seepage, slope.	Piping, low strength.	Slope	Slope, fast intake.	Slope, erodes easily, piping.	Slope, erodes easily.
Travessilla:						
[1]94:						
Travessilla part	Depth to rock, slope.	Thin layer, piping, erodes easily.	Depth to rock, slope.	Slope, droughty.	Depth to rock, slope, erodes easily.	Rooting depth, slope.
Rock outcrop part.						
Truckton:						
95	Slope	Erodes easily, piping.	Slope	Erodes easily, slope.	Erodes easily	Erodes easily, slope.
96	Seepage	Erodes easily, piping.	Slope	Erodes easily, slope.	Erodes easily	Erodes easily.
97	Slope	Erodes easily, piping.	Slope	Erodes easily, slope.	Slope, erodes easily.	Erodes easily, slope.
[1]98:						
Truckton part	Slope	Erodes easily, piping.	Slope	Erodes easily, slope.	Slope, erodes easily.	Erodes easily, slope.
Blakeland part	Seepage, slope.	Piping	Slope	Erodes easily, slope, droughty.	Slope, erodes easily, piping.	Slope, erodes easily, droughty.
[1]99:						
Truckton part	Slope	Erodes easily, piping.	Slope	Erodes easily, slope.	Slope, erodes easily.	Erodes easily, slope.
Bresser part	Seepage, slope.	Piping	Slope	Slope, erodes easily.	Slope, erodes easily, piping.	Slope, erodes easily.
[1]100:						
Truckton part	Slope	Erodes easily, piping.	Slope	Erodes easily, slope.	Erodes easily	Erodes easily, slope.
Bresser part	Seepage, slope.	Piping	Slope	Slope, erodes easily.	Erodes easily, piping.	Slope, erodes easily.
Ustic Torrifluvents:						
101	---	---	Floods	Floods	---	---
Valent:						
102	Seepage, slope.	Piping, seepage.	Slope	Slope, erodes easily, droughty.	Erodes easily, piping.	Erodes easily.
103	Seepage, slope.	Piping, seepage.	Slope	Slope, erodes easily, droughty.	Slope, erodes easily, piping.	Slope, erodes easily.
Vona:						
104	Seepage, slope.	Piping, erodes easily, seepage.	Slope	Slope, fast intake, seepage.	Piping, erodes easily.	Erodes easily.

See footnote at end of table.

TABLE 11.--WATER MANAGEMENT--Continued

Soil name and map symbol	Pond reservoir areas	Embankments, dikes, and levees	Drainage	Irrigation	Terraces and diversions	Grassed waterways
Vona:						
105	Seepage, slope.	Piping, erodes easily, seepage.	Slope	Slope, fast intake, seepage.	Piping, erodes easily.	Slope, erodes easily.
Wigton:						
106	Seepage, slope.	Erodes easily, piping.	Slope, soil blowing.	Slope, droughty, soil blowing.	Erodes easily, piping.	Slope, erodes easily, droughty.
Wiley:						
107	Slope, seepage.	Piping, low strength.	Slope, percs slowly.	Slope, erodes easily.	Piping	Erodes easily.
108	Slope, seepage.	Piping, low strength.	Slope, percs slowly.	Slope, erodes easily.	Slope, piping.	Slope, erodes easily.
Yoder:						
109	Slope, seepage.	Seepage, piping.	Favorable	Droughty, slope.	Erodes easily, piping.	Slope, droughty, erodes easily.
110	Slope, seepage.	Seepage, piping.	Slope	Slope, droughty.	Erodes easily, slope, piping.	Slope, droughty, erodes easily.

[1]This map unit is made up of two or more dominant kinds of soil. See map unit description for the composition and behavior characteristics of the map unit.

TABLE 12.--RECREATIONAL DEVELOPMENT

["Shrink-swell" and some of the other terms that describe restrictive soil features are defined in the Glossary. See text for definitions of "slight," "moderate," and "severe." Absence of an entry means soil was not rated]

Soil name and map symbol	Camp areas	Picnic areas	Playgrounds	Paths and trails
Alamosa: 1	Severe: floods, wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.
Ascalon: 2	Slight	Slight	Moderate: slope.	Slight.
3	Slight	Slight	Severe: slope.	Slight.
Badland: 4.				
Bijou: 5	Moderate: too sandy.	Moderate: too sandy.	Moderate: too sandy, slope.	Moderate: too sandy.
6, 7	Slight	Slight	Moderate: slope.	Slight.
Blakeland: 8	Moderate: too sandy.	Moderate: too sandy.	Moderate: too sandy.	Moderate: too sandy.
[1]9: Blakeland part	Moderate: too sandy.	Moderate: too sandy.	Moderate: too sandy.	Moderate: too sandy.
Fluvaquentic Haplaquolls part	Severe: floods, wetness.	Severe: floods, wetness.	Severe: floods, wetness.	Severe: floods, wetness.
Blendon: 10	Slight	Slight	Slight	Slight.
Bresser: 11	Slight	Slight	Slight	Slight.
12	Slight	Slight	Moderate: slope.	Slight.
13	Slight	Slight	Severe: slope.	Slight.
Brussett: 14, 15	Moderate: percs slowly.	Slight	Moderate: slope, percs slowly.	Slight.
Chaseville: 16	Moderate: small stones.	Moderate: small stones.	Severe: small stones.	Slight.
17	Severe: slope.	Severe: slope.	Severe: small stones, slope.	Moderate: slope, small stones.
[1]18: Chaseville part	Severe: slope.	Severe: slope.	Severe: small stones, slope.	Severe: slope, small stones.

See footnote at end of table.

TABLE 12.--RECREATIONAL DEVELOPMENT--Continued

Soil name and map symbol	Camp areas	Picnic areas	Playgrounds	Paths and trails
Chaseville:				
Midway part	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.
Columbine:				
19	Slight	Slight	Moderate: small stones.	Slight.
Connerton:				
[1]20:				
Connerton part	Severe: slope.	Severe: slope.	Severe: slope.	Moderate: slope.
Rock outcrop part.				
Cruckton:				
21	Slight	Slight	Moderate: slope.	Slight.
Cushman:				
22	Moderate: dusty.	Moderate: dusty.	Moderate: slope, dusty.	Moderate: dusty.
23	Moderate: slope, dusty.	Moderate: slope, dusty.	Severe: slope.	Moderate: dusty.
[1]24:				
Cushman part	Moderate: dusty.	Moderate: dusty.	Severe: slope.	Moderate: dusty.
Kutch part	Moderate: perco slowly.	Moderate: too clayey.	Severe: slope.	Moderate: too clayey.
Elbeth:				
25	Slight	Slight	Moderate: slope.	Slight.
26	Moderate: slope.	Moderate: slope.	Severe: slope.	Slight.
[1]27:				
Elbeth part	Moderate: slope.	Moderate: slope.	Severe: slope.	Slight.
Pring part	Severe: slope.	Severe: slope.	Severe: slope.	Moderate: slope.
Ellicott:				
28	Severe: floods.	Moderate: floods, too sandy.	Severe: floods.	Moderate: too sandy.
Fluvaquentic Haplaquolls:				
29	Severe: wetness, floods.	Severe: wetness, floods.	Severe: wetness, floods.	Severe: wetness, floods.
Fort Collins:				
30	Moderate: dusty.	Moderate: dusty.	Moderate: dusty.	Moderate: dusty.
31	Moderate: dusty.	Moderate: dusty.	Moderate: dusty, slope.	Moderate: dusty.
Fortwingate:				
[1]32:				
Fortwingate part	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.

See footnote at end of table.

TABLE 12.--RECREATIONAL DEVELOPMENT--Continued

Soil name and map symbol	Camp areas	Picnic areas	Playgrounds	Paths and trails
Fortwingate: Rock outcrop part.				
Heldt: 33	Moderate: too clayey.	Moderate: too clayey.	Moderate: percs slowly, too clayey.	Moderate: too clayey.
Holderness: 34	Moderate: percs slowly.	Slight	Moderate: percs slowly, slope.	Slight.
35	Moderate: percs slowly.	Slight	Severe: slope.	Slight.
36	Moderate: percs slowly, slope.	Moderate: slope.	Severe: slope.	Slight.
Jarre: 37	Slight	Slight	Moderate: slope.	Slight.
[1]38: Jarre part	Moderate: slope.	Moderate: slope.	Severe: slope.	Slight.
Tecolote part	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.
Keith: 39	Slight	Slight	Slight	Slight.
Kettle: 40	Moderate: too sandy.	Moderate: too sandy.	Moderate: too sandy, slope.	Moderate: too sandy.
41	Severe: slope.	Severe: slope.	Severe: slope.	Moderate: too sandy, slope.
[1]42: Kettle part	Severe: slope.	Severe: slope.	Severe: slope.	Moderate: too sandy, slope.
Rock outcrop part.				
Kim: 43	Moderate: dusty.	Moderate: dusty.	Moderate: slope, dusty.	Moderate: dusty.
Kutch: 44	Moderate: percs slowly.	Moderate: too clayey.	Moderate: depth to rock, slope, too clayey.	Moderate: too clayey.
45	Moderate: percs slowly, slope.	Moderate: too clayey, slope.	Severe: slope.	Moderate: too clayey.
Kutler: [1]46: Kutler part	Severe: slope.	Severe: slope.	Severe: slope, small stones.	Severe: slope.

See footnote at end of table.

TABLE 12.--RECREATIONAL DEVELOPMENT--Continued

Soil name and map symbol	Camp areas	Picnic areas	Playgrounds	Paths and trails
Kutler:				
Broadmoor part	Severe: slope.	Severe: slope.	Severe: slope, small stones.	Severe: slope.
Rock outcrop part.				
Limon:				
47	Severe: too clayey, percs slowly.	Severe: too clayey.	Severe: too clayey, percs slowly.	Moderate: too clayey.
Louviers:				
48	Severe: too clayey, percs slowly.	Severe: too clayey.	Severe: too clayey, depth to rock, slope.	Severe: too clayey.
49	Severe: slope.	Severe: slope.	Severe: percs slowly, depth to rock, slope.	Moderate: slope, too clayey, small stones.
Manvel:				
50	Moderate: dusty.	Moderate: dusty.	Severe: slope.	Moderate: dusty.
Manzanola:				
51	Moderate: percs slowly, too clayey.	Moderate: too clayey.	Moderate: percs slowly, too clayey.	Moderate: too clayey.
52	Moderate: percs slowly, too clayey.	Moderate: too clayey.	Moderate: slope, percs slowly, too clayey.	Moderate: too clayey.
53	Moderate: percs slowly, too clayey.	Moderate: too clayey.	Severe: slope.	Moderate: too clayey.
Midway:				
54	Severe: percs slowly, too clayey.	Severe: too clayey.	Severe: too clayey, percs slowly, slope.	Moderate: too clayey.
Nederland:				
55	Severe: small stones, slope.	Severe: small stones, slope.	Severe: small stones, slope.	Severe: small stones.
Nelson:				
[1]56:				
Nelson part	Moderate: dusty.	Moderate: dusty.	Severe: slope.	Moderate: dusty.
Tassel part	Moderate: slope, dusty.	Moderate: slope, dusty.	Severe: depth to rock, slope.	Moderate: dusty.
Neville:				
57	Slight	Slight	Severe: slope.	Slight.
[1]58:				
Neville part	Slight	Slight	Severe: slope.	Slight.
Rednun part	Moderate: percs slowly.	Slight	Moderate: percs slowly, slope.	Slight.

See footnote at end of table.

TABLE 12.--RECREATIONAL DEVELOPMENT--Continued

Soil name and map symbol	Camp areas	Picnic areas	Playgrounds	Paths and trails
Nunn:				
59	Moderate: perces slowly.	Moderate: too clayey.	Moderate: perces slowly.	Moderate: too clayey.
Olney:				
60	Moderate: dusty.	Moderate: dusty.	Moderate: dusty.	Moderate: dusty.
61	Moderate: dusty.	Moderate: dusty.	Moderate: slope, dusty.	Moderate: dusty.
[1]62:				
Olney part	Moderate: dusty.	Moderate: dusty.	Moderate: slope, dusty.	Moderate: dusty.
Vona part	Moderate: dusty.	Moderate: dusty.	Moderate: slope, dusty.	Moderate: dusty.
Paunsaugunt:				
[1]63:				
Paunsaugunt part	Severe: slope.	Severe: slope.	Severe: slope, small stones, depth to rock.	Severe: slope.
Rock outcrop part.				
Penrose:				
[1]64:				
Penrose part	Severe: slope.	Severe: slope.	Severe: depth to rock, slope.	Severe: slope.
Manvel part	Moderate: dusty, slope.	Moderate: dusty, slope.	Severe: slope.	Moderate: dusty.
Perrypark:				
65	Slight	Slight	Severe: slope.	Slight.
Peyton:				
66	Slight	Slight	Moderate: slope.	Slight.
67	Slight	Slight	Severe: slope.	Slight.
[1]68:				
Peyton part	Slight	Slight	Moderate: slope.	Slight.
Pring part	Slight	Slight	Moderate: slope, small stones.	Slight.
[1]69:				
Peyton part	Moderate: slope.	Moderate: slope.	Severe: slope.	Slight.
Pring part	Moderate: slope.	Moderate: slope.	Severe: slope.	Slight.
Pits, gravel:				
70.				

See footnote at end of table.

TABLE 12.--RECREATIONAL DEVELOPMENT--Continued

Soil name and map symbol	Camp areas	Picnic areas	Playgrounds	Paths and trails
Pring:				
71	Slight	Slight	Moderate: slope, small stones.	Slight.
72	Moderate: slope.	Moderate: slope.	Severe: slope.	Slight.
Razor:				
73	Moderate: too clayey, percs slowly.	Moderate: too clayey.	Severe: slope.	Moderate: too clayey.
74	Moderate: slope, percs slowly, too clayey.	Moderate: slope, too clayey.	Severe: slope.	Moderate: too clayey.
[1]75:				
Razor part	Moderate: slope, too clayey, percs slowly.	Moderate: slope, too clayey.	Severe: slope.	Moderate: too clayey.
Midway part	Severe: percs slowly, too clayey.	Severe: too clayey.	Severe: too clayey, percs slowly, slope.	Moderate: too clayey.
Rizozo:				
[1]76:				
Rizozo part	Severe: slope.	Severe: slope.	Severe: depth to rock, slope.	Moderate: slope.
Neville part	Moderate: slope.	Moderate: slope.	Severe: slope.	Slight.
Rock outcrop:				
[1]77:				
Rock outcrop part.				
Coldcreek part	Severe: slope.	Severe: slope.	Severe: slope, small stones.	Severe: slope.
Tolman part	Severe: slope.	Severe: slope.	Severe: slope, depth to rock.	Severe: slope.
Sampson:				
78	Slight	Slight	Slight	Slight.
Satanta:				
79	Slight	Slight	Slight	Slight.
80	Slight	Slight	Moderate: slope.	Slight.
[1]81:				
Satanta part	Slight	Slight	Moderate: slope.	Slight.
Neville part	Slight	Slight	Moderate: slope.	Slight.
Schamber:				
[1]82:				
Schamber part	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.

See footnote at end of table.

TABLE 12.--RECREATIONAL DEVELOPMENT--Continued

Soil name and map symbol	Camp areas	Picnic areas	Playgrounds	Paths and trails
Schamber:				
[1]82:				
Razor part	Moderate: slope, too clayey, percs slowly.	Moderate: slope, too clayey.	Severe: slope.	Moderate: too clayey.
Stapleton:				
83	Slight	Slight	Moderate: slope, small stones.	Slight.
84	Moderate: slope.	Moderate: slope.	Severe: slope, small stones.	Slight.
[1]85:				
Stapleton part	Moderate: slope.	Moderate: slope.	Severe: slope, small stones.	Slight.
Bernal part	Slight	Slight	Severe: depth to rock, slope.	Slight.
Stoneham:				
86	Moderate: dusty.	Moderate: dusty.	Moderate: dusty, slope.	Moderate: dusty.
87	Moderate: dusty, slope.	Moderate: dusty, slope.	Severe: slope.	Moderate: dusty.
Stroupe:				
[1]88:				
Stroupe part	Severe: large stones, slope.	Severe: slope.	Severe: large stones, slope.	Severe: slope.
Travessilla part	Severe: slope.	Severe: slope.	Severe: depth to rock, slope.	Severe: slope.
Rock outcrop part.				
Tassel:				
89	Moderate: slope.	Moderate: slope.	Severe: depth to rock, slope.	Slight.
Terry:				
90	Slight	Slight	Moderate: slope, depth to rock.	Slight.
[1]91:				
Terry part	Moderate: slope.	Moderate: slope.	Severe: slope.	Slight.
Razor part	Moderate: too clayey, percs slowly.	Moderate: too clayey.	Severe: slope.	Moderate: too clayey.
Tomah:				
[1]92:				
Tomah part	Slight	Slight	Moderate: slope.	Slight.
Crowfoot part	Slight	Slight	Moderate: slope.	Slight.

See footnote at end of table.

TABLE 12.--RECREATIONAL DEVELOPMENT--Continued

Soil name and map symbol	Camp areas	Picnic areas	Playgrounds	Paths and trails
Tomah:				
193:				
Tomah part	Moderate: slope.	Moderate: slope.	Severe: slope.	Slight.
Crowfoot part	Moderate: slope.	Moderate: slope.	Severe: slope.	Slight.
Travessilla:				
194:				
Travessilla part	Severe: slope.	Severe: slope.	Severe: depth to rock, slope.	Severe: slope.
Rock outcrop part.				
Truckton:				
95	Moderate: too sandy.	Moderate: too sandy.	Moderate: too sandy, slope.	Moderate: too sandy.
96	Slight	Slight	Slight	Slight.
97	Slight	Slight	Severe: slope.	Slight.
198:				
Truckton part	Moderate: slope.	Moderate: slope.	Severe: slope.	Slight.
Blakeland part	Moderate: too sandy.	Moderate: too sandy.	Severe: slope.	Moderate: too sandy.
199:				
Truckton part	Moderate: slope.	Moderate: slope.	Severe: slope.	Slight.
Bresser part	Slight	Slight	Severe: slope.	Slight.
1100:				
Truckton part	Slight	Slight	Moderate: slope.	Slight.
Bresser part	Slight	Slight	Moderate: slope.	Slight.
Ustic Torrifluvents:				
101	Severe: floods.	Moderate: floods.	Moderate: floods.	Slight.
Valent:				
102	Moderate: too sandy.	Moderate: too sandy.	Severe: too sandy.	Severe: too sandy.
103	Moderate: too sandy, slope.	Moderate: too sandy, slope.	Severe: too sandy, slope.	Severe: too sandy.
Vona:				
104	Slight	Slight	Moderate: slope.	Slight.
105	Slight	Slight	Severe: slope.	Slight.
Wigton:				
106	Moderate: too sandy.	Moderate: too sandy.	Moderate: slope, too sandy.	Moderate: too sandy.

See footnote at end of table.

TABLE 12.--RECREATIONAL DEVELOPMENT--Continued

Soil name and map symbol	Camp areas	Picnic areas	Playgrounds	Paths and trails
Wiley:				
107	Moderate: dusty.	Moderate: dusty.	Moderate: dusty, slope.	Moderate: dusty.
108	Moderate: dusty.	Moderate: dusty.	Severe: slope.	Moderate: dusty.
Yoder:				
109	Moderate: small stones.	Moderate: small stones.	Severe: small stones.	Moderate: small stones.
110	Severe: slope.	Severe: slope.	Severe: slope, small stones.	Moderate: slope, small stones.

[1]This map unit is made up of two or more dominant kinds of soil. See map unit description for the composition and behavior characteristics of the map unit.

TABLE 13.--WILDLIFE HABITAT POTENTIALS

[See text for definitions of "good," "fair," "poor," and "very poor." Absence of an entry indicates the soil was not rated. All ratings are for nonirrigated soil]

Soil name and map symbol	Potential for habitat elements								Potential as habitat for--			
	Grain and seed crops	Grasses and legumes	Wild herbaceous plants	Hardwood trees	Coniferous plants	Shrubs	Wetland plants	Shallow water areas	Openland wildlife	Woodland wildlife	Wetland wildlife	Rangeland wildlife
Alamosa:												
1	Very poor.	Poor	Good	---	---	Good	Good	Good	Poor	---	Good	Good.
Ascalon:												
2	Fair	Fair	Fair	---	---	Fair	Poor	Very poor.	Fair	---	Very poor.	Fair.
3	Poor	Fair	Fair	---	---	Fair	Poor	Very poor.	Fair	---	Very poor.	Fair.
Badland:												
4.												
Bijou:												
5	Poor	Fair	Fair	---	---	Fair	Very poor.	Very poor.	Fair	---	Very poor.	Fair.
6, 7	Fair	Fair	Fair	---	---	Fair	Very poor.	Very poor.	Fair	---	Very poor.	Fair.
Blakeland:												
8	Poor	Fair	Fair	---	---	Fair	Very poor.	Very poor.	Fair	---	Very poor.	Fair.
[1]9:												
Blakeland part--	Poor	Fair	Fair	---	---	Fair	Very poor.	Very poor.	Fair	---	Very poor.	Fair.
Fluvaquentic Haplaquolls part	Poor	Poor	Good	---	---	Poor	Good	Good	Fair	---	Good	Fair.
Blendon:												
10	Fair	Fair	Good	---	---	Good	Very poor.	Very poor.	Fair	---	Very poor.	Fair.
Bresser:												
11, 12	Fair	Fair	Fair	---	---	Fair	Poor	Very poor.	Fair	---	Very poor.	Fair.
13	Poor	Fair	Fair	---	---	Fair	Very poor.	Very poor.	Fair	---	Very poor.	Fair.
Brussett:												
14, 15	Fair	Fair	Fair	---	---	Fair	Poor	Very poor.	Fair	---	Very poor.	Fair.
Chaseville:												
16, 17	Poor	Poor	Fair	---	---	Fair	Very poor.	Very poor.	Poor	---	Very poor.	Fair.
[1]18:												
Chaseville part-	Poor	Poor	Fair	---	---	Fair	Very poor.	Very poor.	Poor	---	Very poor.	Fair.
Midway part-----	Very poor.	Very poor	Poor	---	---	Fair	Very poor.	Very poor.	Poor	---	Very poor.	Poor.
Columbine:												
19	Poor	Poor	Fair	---	---	Fair	Very poor.	Very poor.	Poor	---	Very poor.	Fair.

See footnote at end of table.

TABLE 13.--WILDLIFE HABITAT POTENTIALS--Continued

Soil name and map symbol	Potential for habitat elements								Potential as habitat for--			
	Grain and seed crops	Grasses and legumes	Wild herbaceous plants	Hardwood trees	Coniferous plants	Shrubs	Wetland plants	Shallow water areas	Openland wildlife	Woodland wildlife	Wetland wildlife	Rangeland wildlife
Connerton:												
[1]20:												
Connerton part--	Poor	Fair	Fair	---	---	Fair	Very poor.	Very poor.	Fair	---	Very poor.	Fair.
Rock outcrop part.												
Cruckton:												
21	Fair	Fair	Fair	---	---	Fair	Poor	Very poor.	Fair	---	Very poor.	Fair.
Cushman:												
22, 23	Poor	Fair	Fair	---	---	Fair	Poor	Very poor.	Fair	---	Very poor.	Fair.
[1]24:												
Cushman part	Poor	Poor	Fair	---	---	Fair	Poor	Very poor.	Poor	---	Very poor.	Fair.
Kutch part	Poor	Poor	Fair	---	---	Fair	Poor	Very poor.	Poor	---	Very poor.	Fair.
Elbeth:												
25, 26	Poor	Fair	Good	---	Good	Good	Very poor.	Very poor.	Fair	Good	Very poor.	Good.
[1]27:												
Elbeth part	Poor	Fair	Good	---	Good	Good	Very poor.	Very poor.	Fair	Good	Very poor.	Good.
Pring part	Poor	Fair	Fair	---	---	Fair	Very poor.	Very poor.	Fair	---	Very poor.	Fair.
Ellicott:												
28	Very poor.	Very poor.	Poor	---	---	Fair	Poor	Very poor.	Very poor.	---	Very poor.	Fair.
Fluvaquentic Haplaquolls:												
29	Poor	Fair	Good	---	---	Good	Good	Good	Fair	---	Good	Good.
Fort Collins:												
30, 31	Poor	Fair	Fair	---	---	Fair	Poor	Very poor.	Fair	---	Very poor.	Fair.
Fortwingate:												
[1]32:												
Fortwingate part	Very poor.	Very poor.	Good	---	Fair	Fair	Very poor.	Very poor.	Poor	Fair	Very poor.	Good.
Rock outcrop part.												
Heldt:												
33	Fair	Fair	Poor	---	---	Poor	Poor	Very poor.	Fair	---	Very poor.	Poor.
Holderness:												
34, 35, 36	Fair	Fair	Fair	---	---	Fair	Poor	Very poor.	Fair	---	Very poor.	Fair.
Jarre:												
37	Fair	Fair	Fair	---	---	Fair	Poor	Very poor.	Fair	---	Very poor.	Fair.
[1]38:												
Jarre part	Poor	Fair	Fair	---	---	Fair	Very poor.	Very poor.	Fair	---	Very poor.	Fair.

See footnote at end of table.

TABLE 13.--WILDLIFE HABITAT POTENTIALS--Continued

Soil name and map symbol	Potential for habitat elements								Potential as habitat for--			
	Grain and seed crops	Grasses and legumes	Wild herbaceous plants	Hardwood trees	Coniferous plants	Shrubs	Wetland plants	Shallow water areas	Openland wildlife	Woodland wildlife	Wetland wildlife	Rangeland wildlife
Jarre:												
Tecolote part---	Very poor.	Very poor.	Fair	---	Fair	Fair	Very poor.	Very poor.	Poor	Fair	Very poor.	Fair.
Keith:												
39----------	Fair	Fair	Fair	---	Fair	Poor	Very poor.	Very poor.	Fair	---	Very poor.	Fair.
Kettle:												
40, 41----------	Poor	Fair	Good	---	Fair	Good	Very poor.	Very poor.	Fair	Fair	Very poor.	Good.
142:												
Kettle part-----	Poor	Fair	Good	---	Fair	Good	Very poor.	Very poor.	Fair	Fair	Very poor.	Good.
Rock outcrop part.												
Kim:												
43----------	Poor	Fair	Fair	---	---	Fair	Very poor.	Very poor.	Fair	---	Very poor.	Fair.
Kutch:												
44----------	Poor	Poor	Fair	---	---	Fair	Poor	Very poor.	Poor	---	Very poor.	Fair.
45----------	Poor	Poor	Fair	---	---	Fair	Very poor.	Very poor.	Poor	---	Very poor.	Fair.
Kutler:												
146:												
Kutler part-----	Very poor.	Very poor.	Fair	---	---	Fair	Very poor.	Very poor.	Poor	---	Very poor.	Fair.
Broadmoor part--	Very poor.	Very poor.	Fair	---	Poor	Fair	Very poor.	Very poor.	Poor	Poor	Very poor.	---
Rock outcrop part.												
Limon:												
47----------	Fair	Fair	Fair	---	---	Fair	Poor	Very poor.	Fair	---	Very poor.	Fair.
Louviers:												
48----------	Poor	Poor	Poor	---	---	Fair	Very poor.	Very poor.	Poor	---	Very poor.	Fair.
49----------	Poor	Poor	Fair	---	---	Fair	Very poor.	Very poor.	Poor	---	Very poor.	Fair.
Manvel:												
50----------	Poor	Poor	Fair	---	---	Fair	Poor	Very poor.	Poor	---	Very poor.	Fair.
Manzanola:												
51, 52, 53--------	Poor	Poor	Fair	---	---	Fair	Poor	Very poor.	Poor	---	Very poor.	Fair.
Midway:												
54----------	Poor	Poor	Poor	---	---	Fair	Very poor.	Very poor.	Poor	---	Very poor.	Poor.
Nederland:												
55----------	Very poor.	Very poor.	Fair	---	---	Fair	Very poor.	Very poor.	Poor	---	Very poor.	Fair.

See footnote at end of table.

TABLE 13.--WILDLIFE HABITAT POTENTIALS--Continued

Soil name and map symbol	Potential for habitat elements								Potential as habitat for--			
	Grain and seed crops	Grasses and legumes	Wild herbaceous plants	Hardwood trees	Coniferous plants	Shrubs	Wetland plants	Shallow water areas	Openland wildlife	Woodland wildlife	Wetland wildlife	Rangeland wildlife
Nelson:												
[1]56:												
Nelson part	Poor	Fair	Fair	---	---	Fair	Poor	Very poor.	Fair	---	Very poor.	Fair.
Tassel part	Poor	Poor	Poor	---	---	Poor	Very poor.	Very poor.	Poor	---	Very poor.	Poor.
Neville:												
57	Fair	Fair	Fair	---	---	Fair	Very poor.	Very poor.	Fair	---	Very poor.	Fair.
[1]58:												
Neville part	Fair	Fair	Fair	---	---	Fair	Very poor.	Very poor.	Fair	---	Very poor.	Fair.
Rednun part	Fair	Fair	Fair	---	---	Fair	Poor	Very poor.	Fair	---	Very poor.	Fair.
Nunn:												
59	Fair	Fair	Fair	---	---	Fair	Poor	Very poor.	Fair	---	Very poor.	Fair.
Olney:												
60, 61	Poor	Fair	Fair	---	---	Fair	Poor	Very poor.	Fair	---	Very poor.	Fair.
[1]62:												
Olney part	Poor	Poor	Fair	---	---	Fair	Poor	Very poor.	Poor	---	Very poor.	Fair.
Vona part	Poor	Poor	Fair	---	---	Fair	Poor	Very poor.	Poor	---	Very poor.	Fair.
Paunsaugunt:												
[1]63:												
Paunsaugunt part	Very poor.	Very poor.	Poor	---	Very poor.	Poor	Very poor.	Very poor.	Very poor.	Poor	Very poor.	Poor.
Rock outcrop part.												
Penrose:												
[1]64:												
Penrose part	Very poor.	Very poor.	Fair	---	---	Fair	Very poor.	Very poor.	Poor	---	Very poor.	Fair.
Manvel part	Poor	Poor	Fair	---	---	Fair	Poor	Very poor.	Poor	---	Very poor.	Fair.
Perrypark:												
65	Fair	Fair	Good	---	---	Fair	Very poor.	Very poor.	Fair	---	Very poor.	Fair.
Peyton:												
66, 67	Fair	Fair	Fair	---	---	Fair	Poor	Very poor.	Fair	---	Very poor.	Fair.
[1]68:												
Peyton part	Fair	Fair	Fair	---	---	Fair	Poor	Very poor.	Fair	---	Very poor.	Fair.
Pring part	Fair	Fair	Fair	---	---	Fair	Poor	Very poor.	Fair	---	Very poor.	Fair.
[1]69:												
Peyton part	Fair	Fair	Fair	---	---	Fair	Poor	Very poor.	Fair	---	Very poor.	Fair.
Pring part	Poor	Fair	Fair	---	---	Fair	Very poor.	Very poor.	Fair	---	Very poor.	Fair.

See footnote at end of table.

TABLE 13.--WILDLIFE HABITAT POTENTIALS--Continued

Soil name and map symbol	Potential for habitat elements								Potential as habitat for--			
	Grain and seed crops	Grasses and legumes	Wild herbaceous plants	Hardwood trees	Coniferous plants	Shrubs	Wetland plants	Shallow water areas	Openland wildlife	Woodland wildlife	Wetland wildlife	Rangeland wildlife
Pits, gravel: 70.												
Pring: 71	Fair	Fair	Fair	---	---	Fair	Poor	Very poor.	Fair	---	Very poor.	Fair.
72	Poor	Fair	Fair	---	---	Fair	Very poor.	Very poor.	Fair	---	Very poor.	Fair.
Razor: 73	Poor	Poor	Fair	---	---	Fair	Very poor.	Very poor.	Poor	---	Very poor.	Fair.
74	Poor	Poor	Fair	---	---	Fair	Very poor.	Very poor.	Poor	---	Very poor.	Fair.
[1]75: Razor part	Poor	Poor	Fair	---	---	Fair	Very poor.	Very poor.	Poor	---	Very poor.	Fair.
Midway part	Poor	Poor	Poor	---	---	Fair	Very poor.	Very poor.	Poor	---	Very poor.	Fair.
Rizozo: [1]76: Rizozo part	Very poor.	Very poor.	Poor	---	---	Fair	Very poor.	Very poor.	Very poor.	---	Very poor.	Fair.
Neville part	Poor	Fair	Fair	---	---	Fair	Very poor.	Very poor.	Fair	---	Very poor.	Fair.
Rock outcrop: [1]77: Rock outcrop part.												
Coldcreek part	Poor	Fair	Good	---	Good	Good	Very poor.	Very poor.	Fair	Good	Very poor.	---
Tolman part	Poor	Poor	Good	---	---	Good	Very poor.	Very poor.	Fair	---	Very poor.	Good.
Sampson: 78.												
Satanta: 79, 80	Fair	Fair	Fair	---	---	Poor	Very poor.	Very poor.	Fair	---	Very poor.	Fair.
[1]81: Satanta part	Fair	Fair	Fair	---	---	Poor	Very poor.	Very poor.	Fair	---	Very poor.	Fair.
Neville part	Fair	Fair	Fair	---	---	Fair	Very poor.	Very poor.	Fair	---	Very poor.	Fair.
Schamber: [1]82: Schamber part	Very poor.	Poor	Poor	---	---	Poor	Very poor.	Very poor.	Poor	---	Very poor.	Poor.
Razor part	Poor	Poor	Fair	---	---	Fair	Very poor.	Very poor.	Poor	---	Very poor.	Fair.
Stapleton: 83, 84	Poor	Poor	Fair	---	---	Fair	Very poor.	Very poor.	Fair	---	Very poor.	Fair.

See footnote at end of table.

TABLE 13.--WILDLIFE HABITAT POTENTIALS--Continued

Soil name and map symbol	Potential for habitat elements								Potential as habitat for--			
	Grain and seed crops	Grasses and legumes	Wild herbaceous plants	Hardwood trees	Coniferous plants	Shrubs	Wetland plants	Shallow water areas	Openland wildlife	Woodland wildlife	Wetland wildlife	Rangeland wildlife
Stapleton: [1]85:												
Stapleton part--	Poor	Poor	Fair	---	---	Fair	Very poor.	Very poor.	Fair	---	Very poor.	Fair.
Bernal part-----	Poor	Poor	Fair	---	---	Poor	Very poor.	Very poor.	Poor	---	Very poor.	Fair.
Stoneham: 86, 87----------	Poor	Fair	Fair	---	---	Fair	Poor	Very poor.	Fair	---	Very poor.	Fair.
Stroupe: [1]88:												
Stroupe part----	Very poor.	Very poor.	Fair	---	---	Fair	Very poor.	Very poor.	Poor	---	Very poor.	Fair.
Travessilla part	Very poor.	Very poor.	Poor	---	---	Fair	Very poor.	Very poor.	Very poor.	---	Very poor.	Fair.
Rock outcrop part.												
Tassel: 89----------	Very poor.	Poor	Poor	---	---	Poor	Very poor.	Very poor.	Poor	---	Very poor.	Very poor.
Terry: 90----------	Poor	Fair	Fair	---	---	Fair	Poor	Very poor.	Fair	---	Very poor.	Fair.
[1]91:												
Terry part------	Poor	Fair	Fair	---	---	Fair	Poor	Very poor.	Fair	---	Very poor.	Fair.
Razor part------	Poor	Poor	Fair	---	---	Fair	Very poor.	Very poor.	Fair	---	Very poor.	Fair.
Tomah: [1]92:												
Tomah part------	Fair	Fair	Good	---	---	Good	Poor	Very poor.	Fair	---	Very poor.	Good.
Crowfoot part---	Fair	Fair	Good	---	---	Good	Poor	Very poor.	Fair	---	Very poor.	Good.
[1]93:												
Tomah part------	Poor	Fair	Good	---	---	Good	Very poor.	Very poor.	Fair	---	Very poor.	Good.
Crowfoot part---	Poor	Fair	Good	---	---	Good	Very poor.	Very poor.	Fair	---	Very poor.	Good.
Travessilla: [1]94:												
Travessilla part	Very poor.	Very poor.	Poor	---	---	Fair	Very poor.	Very poor.	Very poor.	---	Very poor.	Fair.
Rock outcrop part.												
Truckton: 95----------	Fair	Fair	Fair	---	---	Fair	Poor	Very poor.	Fair	---	Very poor.	Fair.
96, 97----------	Poor	Fair	Fair	---	---	Fair	Very poor.	Very poor.	Fair	---	Very poor.	Fair.

See footnote at end of table.

TABLE 13.--WILDLIFE HABITAT POTENTIALS--Continued

Soil name and map symbol	Potential for habitat elements								Potential as habitat for--			
	Grain and seed crops	Grasses and legumes	Wild herbaceous plants	Hardwood trees	Coniferous plants	Shrubs	Wetland plants	Shallow water areas	Openland wildlife	Woodland wildlife	Wetland wildlife	Rangeland wildlife
Truckton:												
[1]98:												
Truckton part---	Poor	Fair	Fair	---	---	Fair	Very poor.	Very poor.	Fair	---	Very poor.	Fair.
Blakeland part--	Poor	Fair	Fair	---	---	Fair	Very poor.	Very poor.	Fair	---	Very poor.	Fair.
[1]99:												
Truckton part---	Poor	Fair	Fair	---	---	Fair	Very poor.	Very poor.	Fair	---	Very poor.	Fair.
Bresser part----	Poor	Fair	Fair	---	---	Fair	Very poor.	Very poor.	Fair	---	Very poor.	Fair.
[1]100:												
Truckton part---	Poor	Poor	Fair	---	---	Fair	Poor	Very poor.	Poor	---	Very poor.	Fair.
Bresser part----	Poor	Poor	Fair	---	---	Fair	Poor	Very poor.	Poor	---	Very poor.	Fair.
Ustic Torrifluvents: 101----------	Fair	Fair	Fair	---	---	Fair	Poor	Very poor.	Fair	---	Very poor.	Fair.
Valent: 102, 103----------	Poor	Fair	Fair	---	---	Fair	Very poor.	Very poor.	Fair	---	Very poor.	Fair.
Vona:												
104.												
105----------	Poor	Fair	Fair	---	---	Fair	Poor	Very poor.	Fair	---	Very poor.	Fair.
Wigton: 106----------	Poor	Poor	Fair	---	---	Fair	Very poor.	Very poor.	Fair	---	Very poor.	Fair.
Wiley: 107, 108----------	Poor	Fair	Fair	---	---	Poor	Poor	Very poor.	Fair	---	Very poor.	Poor.
Yoder: 109, 110----------	Poor	Poor	Fair	---	---	Fair	Very poor.	Very poor.	Fair	---	Very poor.	Fair.

[1]This map unit is made up of two or more dominant kinds of soil. See map unit description for the composition and behavior characteristics of the map unit.

TABLE 14.--ENGINEERING PROPERTIES AND CLASSIFICATIONS

[The symbol > means greater than. Absence of an entry means data were not estimated. NP is nonplastic]

Soil name and map symbol	Depth	USDA texture	Classification		Fragments > 3 inches	Percentage passing sieve number--				Liquid limit	Plasticity index
			Unified	AASHTO		4	10	40	200		
	In				Pct					Pct	
Alamosa:											
1	0-6	Loam	ML	A-4	0	90-100	80-100	80-95	55-75	30-40	5-10
	6-33	Clay loam, loam	CL	A-6, A-7	0	90-100	80-100	80-100	65-80	35-50	15-30
	33-60	Loam, sandy loam, loamy sand.	ML, SM, CL-ML, SM-SC	A-4, A-2	0	85-100	75-100	50-90	15-70	15-30	NP-10
Ascalon:											
2, 3	0-8	Sandy loam	SM	A-2, A-4	0	85-100	80-100	70-95	25-50	15-25	NP-5
	8-21	Sandy clay loam	SC, CL	A-6	0	85-100	80-100	70-100	40-55	20-40	10-20
	21-30	Sandy loam, sandy clay loam, fine sandy loam.	SC, SM-SC, CL, CL-ML	A-4, A-6	0	85-100	80-100	75-95	35-65	20-40	5-15
	30-60	Fine sandy loam, loamy sand, sandy loam.	SM	A-2	0	95-100	95-100	70-95	20-35	---	NP
Badland:											
4.											
Bijou:											
5	0-8	Loamy sand	SM	A-2, A-1	0	85-100	80-100	40-60	15-30	---	NP
	8-28	Coarse sandy loam, sandy loam.	SC	A-2, A-6	0	85-100	80-100	35-60	25-40	20-40	10-20
	28-60	Loamy coarse sand, loamy sand.	SM	A-1, A-2	0	85-100	80-100	30-50	15-30	---	NP
6, 7	0-8	Sandy loam	SM-SC, SC	A-2, A-4, A-6	0	85-100	80-100	35-60	25-40	20-40	5-15
	8-28	Coarse sandy loam, sandy loam.	SC	A-2, A-6	0	85-100	80-100	35-60	25-40	20-40	10-20
	28-60	Loamy coarse sand, loamy sand.	SM	A-1, A-2	0	85-100	80-100	30-50	15-30	---	NP
Blakeland:											
8	0-11	Loamy sand	SM-SC, SC	A-2	0	95-100	90-100	40-60	15-30	15-30	5-10
	11-60	Loamy sand, loamy coarse sand, sand.	SP-SC, SM-SC	A-2	0	95-100	80-100	35-60	5-25	20-25	5-10
[1]9:											
Blakeland part	0-11	Loamy sand	SM-SC, SC	A-2	0	85-100	80-100	40-60	15-30	15-30	5-10
	11-60	Loamy sand, loamy coarse sand, sand.	SM-SC, SC	A-2	0	85-100	80-100	35-60	5-25	20-25	5-10
Fluvaquentic Haplaquolls part	0-60	Variable	---	---	---	---	---	---	---	---	---
Blendon:											
10	0-23	Sandy loam	SM	A-2, A-4	0	80-100	70-100	60-100	25-50	20-30	NP-5
	23-60	Fine sandy loam, sandy loam.	SM	A-2, A-4	0	80-100	70-100	60-100	25-50	20-30	NP-5

See footnote at end of table.

TABLE 14.--ENGINEERING PROPERTIES AND CLASSIFICATIONS--Continued

Soil name and map symbol	Depth	USDA texture	Classification		Frag-ments > 3 inches	Percentage passing sieve number--				Liquid limit	Plas-ticity index
			Unified	AASHTO		4	10	40	200		
	In				Pct					Pct	
Bresser:											
11, 12, 13	0-8	Sandy loam	SM	A-1, A-2	0	95-100	75-100	35-50	20-35	15-25	NP-5
	8-27	Sandy clay loam	SC	A-2, A-6, A-7	0	95-100	75-100	50-70	30-50	30-55	10-25
	27-36	Sandy loam, coarse sandy loam, gravelly sandy loam.	SC, SM-SC	A-2	0	90-100	60-100	30-60	20-30	25-35	5-20
	36-60	Loamy coarse sand, gravelly loamy sand, very gravelly loamy sand.	SP-SC, SP-SM	A-2	0-5	80-100	35-85	20-50	5-10	20-30	5-10
Brussett:											
14, 15	0-12	Loam	ML	A-4	0	100	95-100	85-95	75-85	30-40	5-10
	12-34	Clay loam, loam	CL	A-6, A-7	0	100	95-100	95-100	80-90	30-50	10-25
	34-60	Silt loam	ML	A-4	0	100	95-100	95-100	80-90	30-40	5-10
Chaseville:											
16, 17	0-19	Gravelly sandy loam.	SP-SM, SM, GM, GP-GM	A-1	0-5	50-85	35-70	15-35	5-25	15-25	NP-5
	19-60	Very gravelly loamy sand, very gravelly sand.	GP, GP-GM, SP, SP-SM	A-1	0-5	40-80	20-50	10-30	0-10	---	NP
[1]18:											
Chaseville part-	0-19	Gravelly sandy loam.	SP-SM, SM, GM, GP-GM	A-1	0-5	50-85	35-70	15-35	5-25	15-25	NP-5
	19-60	Very gravelly loamy sand, very gravelly sand.	GP, GP-GM, SP, SP-SM	A-1	0-5	40-80	20-50	10-30	0-10	---	NP
Midway part	0-4	Clay loam	CL, CH	A-7	0	100	100	90-100	80-95	45-60	20-35
	4-13	Clay	CL, CH	A-7	0	100	100	90-100	80-95	45-60	20-35
	13	Weathered bedrock.	---	---	---	---	---	---	---	---	---
Columbine:											
19	0-6	Gravelly sandy loam.	SM	A-2, A-1	0-5	75-85	50-75	30-40	15-30	---	NP
	6-60	Very gravelly loamy sand, very gravelly coarse sand.	SP, SP-SM, GP, GP-GM	A-1	0-5	40-70	20-50	10-20	0-10	---	NP
Connerton:											
[1]20:											
Connerton part--	0-13	Loam	CL	A-6	0-5	85-100	80-100	70-95	50-75	25-35	10-20
	13-60	Sandy clay loam	CL	A-6	0-5	85-100	80-100	70-95	50-75	25-35	10-20
Rock outcrop part.											
Cruckton:											
21	0-11	Sandy loam	SM, SM-SC	A-2	0	85-100	75-100	50-70	20-30	15-25	NP-10
	11-28	Sandy loam	SC, SM-SC	A-2, A-4, A-6	0	85-100	75-100	50-65	30-40	25-40	5-20
	28-60	Sandy loam, loamy sand.	SC, SM-SC	A-2	0	85-100	75-100	40-60	20-35	25-35	5-15

See footnote at end of table.

TABLE 14.--ENGINEERING PROPERTIES AND CLASSIFICATIONS--Continued

Soil name and map symbol	Depth	USDA texture	Classification		Fragments > 3 inches	Percentage passing sieve number--				Liquid limit	Plasticity index
			Unified	AASHTO		4	10	40	200		
	In				Pct					Pct	
Cushman:											
22, 23	0-5	Loam	ML, CL-ML	A-4	0	100	85-100	85-95	60-75	20-30	NP-10
	5-23	Sandy clay loam	CL	A-6	0	100	90-100	85-95	70-80	25-35	10-15
	23-30	Fine sandy loam	CL-ML	A-4	0	100	85-100	85-95	60-75	25-30	5-10
	30	Weathered bedrock.	---	---	---	---	---	---	---	---	---
[1]24:											
Cushman part	0-5	Loam	ML, CL-ML	A-4	0	100	85-100	85-95	60-75	20-30	NP-10
	5-23	Sandy clay loam	CL	A-6	0	100	90-100	85-95	70-80	25-35	10-15
	23-30	Fine sandy loam	CL-ML	A-4	0	100	85-100	85-95	60-75	25-30	5-10
	30	Weathered bedrock.	---	---	---	---	---	---	---	---	---
Kutch part	0-10	Clay loam	CL	A-6, A-7	0-10	95-100	90-100	90-100	70-80	30-50	20-30
	10-36	Clay, clay loam	CH, CL	A-7	0-5	95-100	90-100	90-100	75-95	45-60	20-35
	36	Weathered bedrock.	---	---	---	---	---	---	---	---	---
Elbeth:											
25, 26	0-23	Sandy loam	SC, SM-SC	A-2, A-4, A-6	0	90-100	75-100	40-55	30-40	25-40	5-15
	23-60	Sandy clay loam	SC, CL	A-6	0	90-100	75-100	40-65	35-55	30-40	10-20
[1]27:											
Elbeth part	0-23	Sandy loam	SC, SM-SC	A-2, A-4, A-6	0	90-100	75-100	40-55	30-40	25-40	5-15
	23-60	Sandy clay loam	SC, CL	A-6	0	90-100	60-100	40-65	35-55	30-40	10-20
Pring part	0-14	Coarse sandy loam.	SM	A-1, A-2	0-5	85-100	50-90	35-50	15-30	15-25	NP-5
	14-60	Coarse sandy loam, gravelly sandy loam.	SM-SC, SC	A-2, A-1	0-5	75-95	50-80	35-50	15-25	20-35	5-15
Ellicott:											
28	0-4	Loamy coarse sand.	SP-SM, SM	A-1	0	70-100	50-100	20-50	5-15	---	NP
	4-60	Stratified coarse sand to sandy loam.	SP-SM, SM	A-1	0-5	70-100	50-95	20-50	5-15	---	NP
Fluvaquentic Haplaquolls:											
29	0-60	Variable	---	---	---	---	---	---	---	---	---
Fort Collins:											
30, 31	0-9	Loam	CL-ML	A-4	0	95-100	80-100	85-100	50-65	25-35	5-10
	9-21	Loam, clay loam	CL	A-6	0	95-100	80-100	85-95	60-75	25-40	10-20
	21-60	Loam	CL, CL-ML	A-4, A-6	0	95-100	80-100	80-95	50-75	25-35	5-15
Fortwingate:											
[1]32:											
Fortwingate part	0-6	Loam	SM, ML	A-4	0	100	100	95-100	40-75	---	NP
	6-23	Clay, clay loam	CL	A-7	0	85-100	80-100	70-100	70-90	40-50	20-35
	23	Weathered bedrock.	---	---	---	---	---	---	---	---	---
Rock outcrop part.											
Heldt:											
33	0-8	Clay loam	CH, CL	A-7	0	85-100	80-100	75-100	65-95	45-55	25-35
	8-60	Silty clay, silty clay loam.	CH, CL	A-7	0	85-100	80-100	75-100	65-95	45-55	25-35

See footnote at end of table.

TABLE 14.--ENGINEERING PROPERTIES AND CLASSIFICATIONS--Continued

Soil name and map symbol	Depth	USDA texture	Classification		Frag-ments > 3 inches	Percentage passing sieve number--				Liquid limit	Plas-ticity index
			Unified	AASHTO		4	10	40	200		
	In				Pct					Pct	
Holderness:											
34, 35, 36	0-9	Loam	ML	A-4	0-5	80-100	70-100	60-95	50-80	20-40	NP-10
	9-43	Clay loam, clay	CL, CH	A-6, A-7	0-5	80-100	70-100	60-95	50-85	35-65	15-35
	43-60	Gravelly sandy clay loam.	CL, SC, CL-ML, SM-SC	A-6, A-4	0-5	80-100	70-100	60-90	40-65	25-40	5-20
Jarre:											
37	0-5	Gravelly sandy loam.	CL-ML, ML, SM, SM-SC	A-4	0-5	85-100	50-100	55-80	45-65	20-30	NP-10
	5-22	Gravelly clay loam, gravelly loam, gravelly sandy clay loam.	CL, SC	A-6, A-2	0-5	85-100	50-100	40-80	25-60	25-40	10-20
	22-60	Very gravelly loam, very gravelly sandy loam.	SM-SC, GM-GC, GP-GC	A-2	0-10	35-85	15-50	10-40	5-30	20-30	5-10
[1]38:											
Jarre part	0-5	Gravelly sandy loam.	CL-ML, ML, SM, SM-SC	A-4	0-5	85-100	50-100	55-80	45-65	20-30	NP-10
	5-22	Gravelly clay loam, gravelly loam, gravelly sandy clay loam.	CL, SC	A-6, A-2	0-5	85-100	50-100	40-80	25-60	25-40	10-20
	22-60	Very gravelly loam, very gravelly sandy loam.	SM-SC, GM-GC	A-2	0-10	35-85	15-50	10-40	5-30	20-30	5-10
Tecolote part	0-3	Stony loam	GM, ML	A-2, A-4, A-1	25-65	50-75	45-70	30-70	15-60	20-30	NP-5
	3-29	Stony fine sandy loam, stony loam, very gravelly sandy loam.	GM	A-2, A-4, A-1	25-65	50-75	45-70	30-65	15-50	20-30	NP-5
	29-45	Stony clay loam, stony sandy clay loam, extremely gravelly sandy clay loam.	GC, CL	A-2, A-6	25-65	50-75	45-70	35-70	15-55	30-40	10-20
	45-60	Extremely gravelly loamy sand.	GM	A-1	25-65	50-75	30-70	30-50	5-15	---	NP
Keith:											
39	0-8	Silt loam	ML, CL-ML	A-4	0	100	100	95-100	85-95	20-35	NP-10
	8-30	Silt loam, silty clay loam.	CL	A-6	0	100	100	95-100	85-100	30-40	10-20
	30-60	Silt loam	ML, CL-ML	A-4	0	100	100	95-100	85-95	20-35	NP-10
Kettle:											
40, 41	0-3	Gravelly loamy sand.	SM	A-1, A-2	0-5	80-95	50-100	25-70	10-25	---	NP
	3-40	Gravelly sandy loam.	SC, SM-SC	A-2	0-5	85-100	50-100	25-70	15-35	25-35	5-15
	40-60	Extremely gravelly loamy sand, very gravelly sand.	SM-SC, SP-SC	A-2	0-5	75-90	20-50	10-25	0-15	20-30	5-10

See footnote at end of table.

TABLE 14.--ENGINEERING PROPERTIES AND CLASSIFICATIONS--Continued

Soil name and map symbol	Depth	USDA texture	Classification		Frag-ments > 3 inches	Percentage passing sieve number--				Liquid limit	Plas-ticity index
			Unified	AASHTO		4	10	40	200		
	In				Pct					Pct	
Kettle:											
42:											
Kettle part-----	0-3	Gravelly loamy sand.	SM	A-1, A-2	0-5	80-95	50-100	25-70	10-25	---	NP
	3-40	Gravelly sandy loam.	SC, SM-SC	A-2	0-5	85-100	50-100	25-70	15-35	25-35	5-15
	40-60	Extremely gravelly loamy sand, very gravelly sand.	SM-SC, SP-SC	A-2	0-5	75-90	20-50	10-25	0-15	20-30	5-10
Rock outcrop part.											
Kim:											
43-----------	0-4	Loam----------	ML, SM	A-4	0-5	80-100	75-100	60-90	45-75	20-35	NP-5
	4-60	Loam, clay loam	CL, CL-ML	A-4, A-6	0-5	80-100	75-100	70-95	60-85	25-40	5-15
Kutch:											
44, 45----------	0-5	Clay loam-------	CL	A-6, A-7	0-10	90-100	80-100	80-100	70-80	30-50	20-30
	5-28	Clay, clay loam	CH, CL	A-7	0-5	90-100	80-100	80-100	75-95	45-60	20-35
	28-36	Extremely shaly clay loam.	GC	A-2	0-10	20-30	10-20	10-20	5-15	45-60	20-35
	36	Weathered bedrock.	---	---	---	---	---	---	---	---	---
Kutler:											
46:											
Kutler part-----	0-6	Very gravelly sandy loam.	GM	A-1	0-5	45-55	40-50	25-35	10-25	15-35	NP-5
	6-23	Very gravelly sandy loam.	GP-GC	A-2	0-5	30-50	20-40	10-25	5-10	15-35	5-15
	23	Weathered bedrock.	---	---	---	---	---	---	---	---	---
Broadmoor part--	0-15	Extremely gravelly sandy loam.	GM	A-1	0-5	30-50	25-45	15-30	10-20	15-35	NP-5
	15-28	Extremely gravelly sandy loam.	GP-GC	A-2	0-5	30-50	20-40	10-20	5-10	20-35	5-15
	28	Weathered bedrock.	---	---	---	---	---	---	---	---	---
Rock outcrop part.											
Limon:											
47----------	0-4	Clay----------	CL	A-6, A-7	0	90-100	85-100	85-100	70-90	30-50	15-30
	4-60	Silty clay loam, silty clay.	CH, CL	A-7	0	90-100	85-100	85-100	75-95	40-60	20-40
Louviers:											
48----------	0-5	Silty clay loam	CL, CH	A-7, A-6	0	90-100	80-100	80-100	75-95	35-55	15-30
	5-14	Clay, silty clay, silty clay loam.	CL, CH	A-7, A-6	0	90-100	80-100	80-100	75-95	35-60	20-35
	14	Weathered bedrock.	---	---	---	---	---	---	---	---	---
49----------	0-5	Cobbly clay loam	CL, CH	A-7, A-6	40-50	75-100	75-100	75-100	70-80	35-55	15-30
	5-14	Clay, silty clay, silty clay loam.	CL, CH	A-7, A-6	0-15	90-100	80-100	80-100	75-95	35-60	20-35
	14	Weathered bedrock.	---	---	---	---	---	---	---	---	---
Manvel:											
50----------	0-3	Loam----------	CL-ML, CL	A-4, A-6	0	100	95-100	95-100	75-90	25-35	5-15
	3-60	Silt loam, silty clay loam, loam.	CL, ML	A-6, A-4	0	100	95-100	95-100	80-90	30-40	5-20

See footnote at end of table.

TABLE 14.--ENGINEERING PROPERTIES AND CLASSIFICATIONS--Continued

Soil name and map symbol	Depth	USDA texture	Classification		Frag-ments > 3 inches	Percentage passing sieve number--				Liquid limit	Plas-ticity index
			Unified	AASHTO		4	10	40	200		
	In				Pct					Pct	
Manzanola:											
51, 52, 53	0-6	Clay loam	CL, CL-ML	A-4, A-6	0-5	95-100	80-95	70-95	50-75	25-40	5-20
	6-32	Clay loam, clay	CL	A-6, A-7	0-5	95-100	90-100	85-95	65-85	35-50	20-30
	32-60	Clay loam, loam	CL	A-6	0-5	95-100	90-100	85-95	60-80	30-40	10-20
Midway:											
54	0-4	Clay loam	CL, CH	A-7	0	100	95-100	90-100	80-95	45-60	20-35
	4-13	Clay	CL, CH	A-7	0	100	95-100	90-100	80-95	45-60	20-35
	13	Weathered bedrock.	---	---	---	---	---	---	---	---	---
Nederland:											
55	0-5	Cobbly sandy loam.	SM-SC, SM	A-2	25-45	70-90	70-85	40-55	20-35	25-35	5-10
	5-28	Very cobbly clay loam.	SC	A-2, A-6, A-7	50-60	70-90	70-90	40-65	25-50	30-50	10-25
	28-60	Very cobbly sandy loam.	SM-SC, SC	A-2	50-60	65-80	60-80	30-50	20-30	20-35	5-15
Nelson:											
[1]56:											
Nelson part	0-7	Fine sandy loam	ML, SM	A-4	0-5	75-100	75-100	70-90	45-60	---	NP
	7-26	Fine sandy loam, sandy loam.	SM, ML	A-4, A-2	0	75-100	75-100	60-85	30-55	---	NP
	26	Weathered bedrock.	---	---	---	---	---	---	---	---	---
Tassel part	0-10	Fine sandy loam	ML, SM	A-4	0	95-100	90-100	70-95	40-65	20-35	NP-5
	10	Unweathered bedrock.	---	---	---	---	---	---	---	---	---
Neville:											
57	0-10	Fine sandy loam	SM, ML	A-4	0-5	90-100	75-100	70-95	40-75	15-25	NP-5
	10-60	Loam, clay loam	CL-ML, CL	A-4, A-6	0-5	90-100	85-100	85-95	60-80	20-40	5-15
[1]58:											
Neville part	0-10	Fine sandy loam	SM, ML	A-4	0-5	90-100	75-100	70-95	40-75	15-25	NP-5
	10-60	Loam, clay loam	CL-ML, CL	A-4, A-6	0-5	90-100	85-100	85-95	60-80	20-40	5-15
Rednun part	0-6	Loam	CL-ML, CL	A-4, A-6	0	100	95-100	85-95	60-75	20-30	5-15
	6-29	Clay loam, clay	CL, CH	A-6, A-7	0	100	90-100	85-100	70-95	35-60	20-40
	29-60	Loam, clay loam	CL	A-6	0	100	90-100	85-95	60-75	30-40	15-20
Nunn:											
59	0-12	Clay loam	CL, SC	A-6	0-5	95-100	80-95	70-95	45-75	25-40	10-20
	12-30	Clay loam, clay	CL, CH	A-6, A-7	0-5	95-100	90-100	85-95	65-75	35-60	20-35
	30-60	Clay loam, sandy clay loam, clay.	CL, SC, CL-ML, SM-SC	A-4, A-6, A-2	0-5	80-100	80-100	60-90	25-75	15-40	5-20
Olney:											
60, 61	0-6	Sandy loam	SM	A-2	0	95-100	80-100	65-95	20-35	15-25	NP-5
	6-21	Sandy clay loam	SC, CL	A-6	0	95-100	80-100	75-100	40-55	20-40	10-20
	21-60	Sandy loam, loamy sand, fine sandy loam.	SC, CL, SM-SC, CL-ML	A-4, A-6	0	95-100	80-100	70-95	35-55	20-35	5-15
[1]62:											
Olney part	0-6	Sandy loam	SM	A-2	0	95-100	90-100	70-95	20-35	15-25	NP-5
	6-21	Sandy clay loam	SC, CL	A-6	0	95-100	90-100	80-100	40-55	20-40	10-20
	21-60	Sandy loam, sandy clay loam, fine sandy loam.	SC, SM-SC, CL, CL-ML	A-4, A-6	0	95-100	95-100	75-95	35-55	20-35	5-15

See footnote at end of table.

TABLE 14.--ENGINEERING PROPERTIES AND CLASSIFICATIONS--Continued

Soil name and map symbol	Depth	USDA texture	Classification		Fragments > 3 inches	Percentage passing sieve number--				Liquid limit	Plasticity index
			Unified	AASHTO		4	10	40	200		
	In				Pct					Pct	
Olney:											
Vona part	0-8	Sandy loam	SM	A-2, A-4	0	100	90-100	60-90	30-45	---	NP
	8-30	Fine sandy loam,	SM	A-2, A-4	0	100	90-100	60-90	30-45	---	NP
	30-60	Sandy loam, loamy sand.	SM	A-2	0	100	90-100	50-85	15-30	---	NP
Paunsaugunt:											
163:											
Paunsaugunt part	0-6	Gravelly loam	GM-GC	A-4	0-5	50-70	45-65	45-60	40-50	20-30	5-10
	6-17	Very gravelly loam.	GM	A-1, A-2	0-5	40-55	35-50	35-50	15-30	15-20	NP-5
	17	Unweathered bedrock.	---	---	---	---	---	---	---	---	---
Rock outcrop part.											
Penrose:											
164:											
Penrose part	0-11	Channery loam	ML, GM	A-4	5-20	60-75	60-75	50-75	40-60	15-25	NP-5
	11	Weathered bedrock.	---	---	---	---	---	---	---	---	---
Manvel part	0-3	Loam	CL-ML, CL	A-4, A-6	0	95-100	95-100	95-100	70-90	25-35	5-15
	3-60	Silt loam, silty clay loam, loam.	CL, CL-ML	A-6, A-4	0	95-100	95-100	95-100	80-90	20-40	5-20
Perrypark:											
165	0-4	Gravelly sandy loam.	SM	A-2	0-5	70-85	60-75	55-70	30-35	10-20	NP-5
	4-48	Sandy clay loam	SC, CL	A-6	0-5	80-100	75-100	60-90	35-55	20-35	10-20
	48-60	Sandy loam	SM	A-2	0-5	80-100	75-100	50-75	15-35	10-20	NP-5
Peyton:											
166, 167	0-12	Sandy loam	SC	A-2	0	95-100	75-100	35-50	20-35	30-45	10-25
	12-25	Sandy clay loam	SC	A-2, A-6, A-7	0	95-100	75-100	55-70	30-50	35-50	15-25
	25-60	Sandy loam, coarse sandy loam, gravelly sandy loam.	SC	A-2	0	90-100	60-100	30-60	20-35	25-40	10-20
168, 169:											
Peyton part	0-12	Sandy loam	SC	A-2	0	95-100	75-100	35-50	20-35	30-45	10-25
	12-25	Sandy clay loam	SC	A-2, A-6, A-7	0	95-100	75-100	55-70	30-50	35-50	15-25
	25-60	Sandy loam, coarse sandy loam, gravelly sandy loam.	SC	A-2	0	90-100	60-100	30-60	20-35	25-40	10-20
Pring part	0-14	Coarse sandy loam.	SM	A-2	0-5	85-100	75-90	35-50	15-30	15-25	NP-5
	14-60	Coarse sandy loam, gravelly sandy loam.	SM-SC, SC	A-2, A-1	0-5	75-95	50-80	35-50	15-25	20-35	5-15
Pits, gravel:											
170.											
Pring:											
171, 172	0-14	Coarse sandy loam.	SM	A-2	0-5	85-100	75-90	35-50	15-30	15-25	NP-5
	14-60	Coarse sandy loam, gravelly sandy loam.	SM-SC, SC	A-2, A-1	0-5	75-95	50-80	35-50	15-25	20-35	5-15

See footnote at end of table.

TABLE 14.--ENGINEERING PROPERTIES AND CLASSIFICATIONS--Continued

Soil name and map symbol	Depth	USDA texture	Classification		Fragments > 3 inches	Percentage passing sieve number--				Liquid limit	Plasticity index
			Unified	AASHTO		4	10	40	200		
	In				Pct					Pct	
Razor:											
73	0-3	Clay loam	CL	A-6	0	100	100	90-100	75-85	30-40	10-20
	3-31	Clay loam, clay	CL, CH	A-7	0	100	100	90-100	80-95	45-60	20-35
	31	Unweathered bedrock.	---	---	---	---	---	---	---	---	---
74	0-4	Stony clay loam	CL	A-7	5-30	80-100	80-100	80-100	70-80	40-50	20-30
	4-29	Cobbly clay	CL, CH	A-7	5-30	80-100	80-100	80-100	70-95	40-60	20-35
	29	Weathered bedrock.	---	---	---	---	---	---	---	---	---
[1]75:											
Razor part	0-3	Clay loam	CL	A-6	0	100	100	90-100	75-85	30-40	10-20
	3-31	Clay loam, clay	CL, CH	A-7	0	100	100	90-100	80-95	45-60	20-35
	31	Unweathered bedrock.	---	---	---	---	---	---	---	---	---
Midway part	0-4	Clay loam	CL, CH	A-7	0	100	100	90-100	80-95	45-60	20-35
	4-13	Clay	CL, CH	A-7	0	100	100	90-100	80-95	45-60	20-35
	13	Weathered bedrock.	---	---	---	---	---	---	---	---	---
Rizozo:											
[1]76:											
Rizozo part	0-10	Loam	ML, CL-ML	A-4	0-20	80-95	75-90	55-85	50-80	20-35	5-10
	10	Unweathered bedrock.	---	---	---	---	---	---	---	---	---
Neville part	0-10	Fine sandy loam	SM, ML	A-4	0-5	90-100	75-100	70-95	40-75	15-25	NP-5
	10-60	Loam, clay loam	CL-ML, CL	A-4, A-6	0-5	90-100	85-100	85-95	60-80	20-40	5-15
Rock outcrop:											
[1]77:											
Rock outcrop part.											
Coldcreek part	0-6	Cobbly loam	ML, SM	A-2, A-4	10-30	65-85	60-75	40-70	25-55	20-35	NP-10
	6-31	Extremely cobbly sandy loam.	GM	A-1, A-2	40-50	40-50	40-50	25-40	10-25	20-35	NP-10
	31-43	Extremely cobbly clay loam.	GM	A-2, A-4	40-60	40-60	40-60	35-60	30-50	25-35	NP-10
	43	Fragmental material.	---	---	---	---	---	---	---	---	---
Tolman part	0-4	Gravelly sandy loam.	GM	A-1, A-2	5-25	35-65	25-55	20-50	10-25	20-35	NP-10
	4-13	Very cobbly sandy clay loam.	GM	A-1, A-2	5-25	30-60	25-55	20-50	15-35	20-35	5-10
	13	Unweathered bedrock.	---	---	---	---	---	---	---	---	---
Sampson:											
78	0-15	Loam	ML, CL-ML	A-4	0	95-100	90-100	75-95	50-65	25-35	5-10
	15-34	Clay loam, loam	CL	A-6	0	95-100	90-100	80-90	60-75	25-40	15-25
	34-60	Loam, sandy clay loam.	ML, CL, SM, SC	A-4, A-6	0	90-100	75-100	60-90	35-70	20-35	NP-15
Satanta:											
79, 80	0-9	Loam	ML	A-4	0	100	95-100	80-100	50-85	20-35	NP-5
	9-30	Loam, clay loam, sandy clay loam.	SC, CL	A-7, A-6	0	100	95-100	50-85	45-75	30-45	10-25
	30-60	Loam, silt loam	ML	A-4	0	100	95-100	80-100	50-85	20-35	NP-10
[1]81:											
Satanta part	0-9	Loam	ML	A-4	0	100	95-100	80-100	50-85	20-35	NP-5
	9-30	Loam, clay loam, sandy clay loam.	SC, CL	A-7, A-6	0	100	95-100	50-85	45-75	30-45	10-25
	30-60	Loam, clay loam	ML, CL	A-4, A-6	0	100	95-100	80-100	50-85	20-36	2-15

See footnote at end of table.

TABLE 14.--ENGINEERING PROPERTIES AND CLASSIFICATIONS--Continued

Soil name and map symbol	Depth	USDA texture	Classification		Fragments > 3 inches	Percentage passing sieve number--				Liquid limit	Plasticity index
			Unified	AASHTO		4	10	40	200		
	In				Pct					Pct	
Satanta:											
Neville part----	0-10	Fine sandy loam	SM, ML	A-4	0-5	90-100	75-100	70-95	40-75	15-25	NP-5
	10-60	Loam, clay loam	CL-ML, CL	A-4, A-6	0-5	90-100	85-100	85-95	60-80	20-40	5-15
Schamber:											
[1]82:											
Schamber part---	0-14	Gravelly loam---	SC, CL, SM-SC, CL-ML	A-2, A-4, A-6	0-15	80-100	60-75	50-70	30-65	25-40	5-20
	14-60	Very gravelly sand.	GM, GW, SM	A-1	0-25	30-60	25-45	10-20	0-15	15-25	NP-5
Razor part------	0-3	Clay loam-------	CL	A-6	0	100	100	90-100	75-85	30-40	10-20
	3-31	Clay loam, clay	CL, CH	A-7	0	100	100	90-100	80-95	45-60	20-25
	31	Unweathered bedrock.	---	---	---	---	---	---	---	---	---
Stapleton:											
83, 84----------	0-26	Sandy loam------	SM-SC	A-2, A-4	0-5	85-100	75-95	35-50	30-40	15-25	5-10
	26-60	Gravelly loamy sand.	SM	A-2	0-5	85-100	50-75	25-50	15-30	20-40	5-15
[1]85:											
Stapleton part--	0-26	Sandy loam------	SM-SC	A-2, A-4	0-5	85-90	75-95	35-50	30-40	15-25	5-10
	26-60	Gravelly loamy sand.	SM	A-2	0-5	85-100	50-75	25-50	15-30	20-40	5-15
Bernal part-----	0-4	Sandy loam------	SC, CL, CL-ML, SC-SM	A-6, A-4	0	100	100	65-95	45-60	20-35	5-15
	4-13	Sandy clay loam	SC	A-2, A-4, A-6	0	100	75-100	50-70	30-50	30-40	10-25
	13	Unweathered bedrock.	---	---	---	---	---	---	---	---	---
Stoneham:											
86, 87----------	0-4	Sandy loam------	SM, ML	A-4, A-2	0	90-100	75-100	60-85	30-55	10-20	NP-5
	4-16	Clay loam, sandy clay loam, loam.	CL, SC, CL-ML, SM-SC	A-6, A-4	0	95-100	90-100	80-100	35-80	25-40	5-25
	16-60	Loam, sandy loam	CL, SC, SM-SC, CL-ML	A-4, A-6, A-2	0	95-100	75-100	60-95	30-75	15-30	5-15
Stroupe:											
[1]88:											
Stroupe part----	0-8	Stony loam------	SM, ML	A-4	45-70	80-95	75-90	65-85	45-65	15-30	NP-5
	8-35	Stony clay, very stony clay, very stony clay loam.	GC, CL	A-6, A-7	30-50	65-80	60-75	55-75	45-70	35-45	15-25
	35	Unweathered bedrock.	---	---	---	---	---	---	---	---	---
Travessilla part	0-11	Sandy loam------	SM	A-2, A-4	0-10	75-100	60-100	50-65	15-40	---	NP
	11	Unweathered bedrock.	---	---	---	---	---	---	---	---	---
Rock outcrop part.											
Tassel:											
89----------	0-10	Fine sandy loam	ML, SM	A-4	0	95-100	90-100	70-95	40-65	20-35	NP-5
	10	Unweathered bedrock.	---	---	---	---	---	---	---	---	---
Terry:											
90----------	0-5	Sandy loam------	SM, ML	A-2, A-4	0-5	75-100	75-100	70-90	30-60	---	NP
	5-23	Fine sandy loam, sandy loam.	SM, ML	A-4	0	75-100	75-100	70-85	40-60	---	NP
	23	Weathered bedrock.	---	---	---	---	---	---	---	---	---

See footnote at end of table.

TABLE 14.--ENGINEERING PROPERTIES AND CLASSIFICATIONS--Continued

Soil name and map symbol	Depth	USDA texture	Classification		Frag-ments > 3 inches	Percentage passing sieve number--				Liquid limit	Plas-ticity index
			Unified	AASHTO		4	10	40	200		
	In				Pct					Pct	
Terry:											
[1]91:											
Terry part------	0-5	Sandy loam------	SM, ML	A-2, A-4	0-5	75-100	75-100	70-90	30-60	---	NP
	5-23	Fine sandy loam, sandy loam.	SM, ML	A-4	0	75-100	75-100	70-85	40-60	---	NP
	23	Weathered bedrock.	---	---	---	---	---	---	---	---	---
Razor part------	0-3	Clay loam-------	CL	A-6	0	100	100	90-100	75-85	30-40	10-20
	3-31	Clay loam, clay	CL, CH	A-7	0	100	100	90-100	80-95	45-60	20-35
	31	Unweathered bedrock.	---	---	---	---	---	---	---	---	---
Tomah:											
[1]92, [1]93:											
Tomah part------	0-10	Loamy sand------	SM	A-2, A-4	0	95-100	90-100	60-80	30-40	20-30	NP-5
	10-22	Sand------------	SM	A-2	0	95-100	80-100	50-75	15-30	10-20	NP-5
	22-48	Stratified sandy clay loam to coarse sand.	SC	A-2, A-6	0	95-100	75-100	40-65	25-45	20-40	10-20
	48-60	Coarse sand------	SM-SC	A-2, A-1	0	90-100	75-90	30-45	10-25	15-25	5-10
Crowfoot part---	0-12	Loamy sand------	SM	A-2, A-4	0-5	85-100	75-100	40-60	25-40	20-30	NP-5
	12-23	Sand------------	SM	A-2, A-1	0-5	85-100	75-100	35-55	15-30	---	NP
	23-36	Sandy clay loam	CL, SC	A-6	0-5	85-100	75-100	60-85	45-55	30-40	10-20
	36-60	Coarse sand------	SM	A-1, A-2	0-5	75-100	65-90	25-60	15-30	---	NP
Travessilla:											
[1]94:											
Travessilla part	0-11	Sandy loam------	SM	A-2, A-4	0-10	75-100	60-95	50-65	15-40	---	NP
	11	Unweathered bedrock.	---	---	---	---	---	---	---	---	---
Rock outcrop part.											
Truckton:											
95----------	0-8	Loamy sand------	SM	A-2	0	95-100	95-100	50-70	20-30	15-25	NP-5
	8-24	Sandy loam------	SC, SM-SC	A-2, A-4, A-6	0	95-100	95-100	60-70	30-40	20-40	5-20
	24-60	Sandy loam, loamy sand.	SC, SM-SC	A-2	0	95-100	95-100	50-65	20-35	20-35	5-15
96, 97----------	0-8	Sandy loam------	SM	A-2	0	95-100	95-100	50-70	20-30	15-25	NP-5
	8-24	Sandy loam------	SC, SM-SC	A-2, A-4, A-6	0	95-100	95-100	60-70	30-40	20-40	5-20
	24-60	Sandy loam, loamy sand.	SC, SM-SC	A-2	0	95-100	95-100	50-65	20-35	20-35	5-15
[1]98:											
Truckton part---	0-8	Sandy loam------	SM	A-2	0	95-100	95-100	50-70	20-30	15-25	NP-5
	8-24	Sandy loam------	SC, SM-SC	A-2, A-4, A-6	0	95-100	95-100	60-70	30-40	20-40	5-20
	24-60	Sandy loam, loamy sand.	SC, SM-SC	A-2	0	95-100	95-100	50-65	20-35	20-35	5-15
Blakeland part--	0-11	Loamy sand------	SM-SC	A-2	0	95-100	90-100	40-60	15-30	10-30	5-10
	11-60	Loamy sand, loamy coarse sand, sand.	SP-SC, SM-SC	A-2	0	95-100	80-100	35-60	5-25	20-25	5-10

See footnote at end of table.

TABLE 14.--ENGINEERING PROPERTIES AND CLASSIFICATIONS--Continued

Soil name and map symbol	Depth	USDA texture	Classification		Frag-ments > 3 inches	Percentage passing sieve number--				Liquid limit	Plas-ticity index
			Unified	AASHTO		4	10	40	200		
	In				Pct					Pct	
Truckton:											
[1]99, [1]100:											
Truckton part---	0-8	Sandy loam------	SM	A-2	0	95-100	95-100	50-70	20-30	15-25	NP-5
	8-24	Sandy loam------	SC, SM-SC	A-2, A-4, A-6	0	95-100	95-100	60-70	30-40	20-40	5-20
	24-60	Sandy loam, loamy sand.	SC, SM-SC	A-2	0	95-100	95-100	50-65	20-35	20-35	5-15
Bresser part----	0-8	Sandy loam------	SM	A-1, A-2	0	95-100	75-100	35-50	20-35	15-25	NP-5
	8-27	Sandy clay loam	SC, SM	A-2, A-6, A-7	0	95-100	75-100	50-70	30-50	30-55	10-25
	27-36	Sandy loam, coarse sandy loam, gravelly sandy loam.	SC, SM-SC	A-2	0	90-100	60-100	30-60	20-30	25-35	5-20
	36-60	Loamy coarse sand, gravelly loamy sand, very gravelly loamy sand.	SP-SC	A-2	0-5	80-100	35-85	20-50	5-10	20-30	5-10
Ustic Torrifluvents:											
101----------	0-60	Variable--------	---	---	---	---	---	---	---	---	---
Valent:											
102, 103----------	0-6	Sand----------	SP-SM, SM	A-2, A-3	0	100	100	70-90	5-20	---	NP
	6-60	Fine sand, sand	SP-SM, SM	A-2, A-3	0	100	95-100	75-90	5-20	---	NP
Vona:											
104, 105----------	0-7	Sandy loam------	SM	A-2, A-4	0	90-100	80-100	70-90	30-45	---	NP
	7-40	Fine sandy loam, sandy loam.	SM	A-2, A-4	0	90-100	80-100	70-90	30-45	---	NP
	40-60	Fine sandy loam, loamy sand.	SM	A-2	0	90-100	80-100	60-85	15-30	---	NP
Wigton:											
106----------	0-19	Loamy sand------	SM	A-1, A-2	0	95-100	75-100	20-65	15-30	---	NP
	19-60	Coarse sand, sand.	SM, SP-SM	A-1	0	95-100	75-100	30-50	5-25	---	NP
Wiley:											
107, 108----------	0-5	Silt loam-------	CL-ML, CL	A-4, A-6	0	100	100	90-100	75-90	25-35	5-15
	5-23	Silty clay loam, silt loam.	CL	A-6	0	100	100	90-100	75-95	25-35	10-20
	23-60	Silt loam, silty clay loam, loam.	CL-ML, CL	A-4, A-6	0	100	100	90-100	75-90	25-35	5-15
Yoder:											
109, 110----------	0-6	Gravelly sandy loam.	SM	A-1, A-2	0-5	60-100	50-100	30-50	15-35	---	NP
	6-12	Coarse sandy loam, gravelly sandy clay loam, sandy clay loam.	SM-SC	A-1, A-2, A-4	0-5	60-100	50-100	30-60	20-45	20-30	5-10
	12-60	Very gravelly loamy coarse sand.	GP-GM, SP-SM, SM, GM	A-1	0-5	35-75	20-50	10-25	5-15	---	NP

[1]This map unit is made up of two or more dominant kinds of soil. See map unit description for the composition and behavior characteristics of the map unit.

TABLE 15.--PHYSICAL AND CHEMICAL PROPERTIES OF SOILS

[The symbol < means less than; > means greater than. Erosion factor T and wind group are for the entire profile. Absence of an entry means data were not available or amounts were insignificant]

Soil name and map symbol	Depth	Permeability	Available water capacity	Soil reaction	Salinity	Shrink-swell potential	Risk of corrosion		Erosion factors		Wind erodibility group
							Uncoated steel	Concrete	K	T	
	In	In/hr	In/in	pH	Mmhos/cm						
Alamosa:											
1	0-6	0.6-2.0	0.16-0.20	6.1-7.3	2-16	Low	High	Moderate	0.28	5	6
	6-33	0.2-0.6	0.18-0.20	6.6-8.4	2-16	Moderate	High	Moderate	0.28		
	33-60	0.6-2.0	0.08-0.16	7.4-8.4	<16	Low	High	Moderate	0.28		
Ascalon:											
2, 3	0-8	0.6-6.0	0.11-0.16	6.6-7.8	<2	Low	Low	Low	0.17	5	3
	8-21	0.6-2.0	0.13-0.15	6.6-7.8	<2	Moderate	Moderate	Low	0.24		
	21-30	0.6-2.0	0.11-0.15	6.6-7.8	<2	Low	Moderate	Low	0.24		
	30-60	2.0-6.0	0.06-0.13	7.4-8.4	<2	Low	Moderate	Low	0.17		
Badland:											
4.											
Bijou:											
5	0-8	6.0-20	0.06-0.08	6.1-7.8	---	Low	Low	Low	0.10	5	2
	8-28	6.0-20	0.10-0.12	6.1-7.8	<2	Low	Moderate	Low	0.10		
	28-60	6.0-20	0.05-0.07	6.6-7.8	<2	Low	Moderate	Low	0.10		
6, 7	0-8	6.0-20	0.08-0.12	6.6-7.3	---	Low	Low	Low	0.10	5	3
	8-28	6.0-20	0.10-0.12	6.6-7.8	<2	Low	Moderate	Low	0.10		
	28-60	6.0-20	0.05-0.07	6.6-7.8	<2	Low	Moderate	Low	0.10		
Blakeland:											
8	0-11	6.0-20	0.06-0.09	6.1-7.8	---	Low	Low	Low	0.10	5	2
	11-60	6.0-20	0.05-0.08	6.1-7.8	---	Low	Low	Low	0.10		
[1]9:											
Blakeland part	0-11	6.0-20	0.06-0.09	6.1-7.8	---	Low	Low	Low	0.10	5	2
	11-60	6.0-20	0.05-0.08	6.1-7.8	---	Low	Low	Low	0.10		
Fluvaquentic Haplaquolls part	0-60	---	---	---	---	---	---	---	---	---	---
Blendon:											
10	0-23	2.0-6.0	0.11-0.17	6.1-7.3	---	Low	Moderate	Low	0.20	5	3
	23-60	2.0-6.0	0.11-0.17	6.1-7.3	---	Low	Moderate	Low	0.20		
Bresser:											
11, 12, 13	0-8	0.6-6.0	0.11-0.13	6.1-7.3	---	Low	Moderate	Low	0.10	5	2
	8-27	0.6-2.0	0.15-0.18	6.1-7.3	---	Low	Moderate	Low	0.15		
	27-36	0.6-2.0	0.10-0.13	6.1-7.3	---	Low	Moderate	Low	0.10		
	36-60	2.0-20	0.05-0.08	6.1-7.3	---	Low	Moderate	Low	0.10		
Brussett:											
14, 15	0-12	0.6-2.0	0.17-0.20	6.1-7.3	---	Low	Moderate	Low	0.28	5	6
	12-34	0.6-2.0	0.16-0.18	6.1-7.8	<2	Moderate	High	Low	0.37		
	34-60	0.6-2.0	0.16-0.18	6.1-8.4	<2	Low	High	Low	0.43		
Chaseville:											
16, 17	0-19	6.0-20	0.06-0.09	6.1-7.3	---	Low	Moderate	Low	0.15	2	8
	19-60	6.0-20	0.04-0.06	6.1-7.3	---	Low	Moderate	Low	0.10		
[1]18:											
Chaseville part	0-19	6.0-20	0.06-0.09	6.1-7.3	---	Low	Moderate	Low	0.15	2	8
	19-60	6.0-20	0.04-0.06	6.1-7.3	---	Low	Moderate	Low	0.10		
Midway part	0-4	0.06-0.2	0.12-0.17	7.9-9.0	2-8	High	High	High	0.43	1	4
	4-13	0.06-0.2	0.14-0.17	7.9-9.0	2-8	High	High	High	0.37		
	13	---	---	---	---	---	---	---	---		
Columbine:											
19	0-6	6.0-20	0.07-0.09	6.1-7.8	---	Low	Moderate	Low	0.10	2	6
	6-60	>20	0.04-0.08	6.1-7.8	---	Low	Moderate	Low	0.10		

See footnote at end of table.

TABLE 15.--PHYSICAL AND CHEMICAL PROPERTIES OF SOILS--Continued

Soil name and map symbol	Depth	Permeability	Available water capacity	Soil reaction	Salinity	Shrink-swell potential	Risk of corrosion: Uncoated steel	Risk of corrosion: Concrete	Erosion factors: K	Erosion factors: T	Wind erodibility group
	In	In/hr	In/in	pH	Mmhos/cm						
Connerton:											
120:											
Connerton part--	0-13	0.6-2.0	0.16-0.18	7.4-8.4	<4	Moderate	High-----	High-----	0.43	5	4L
	13-60	0.6-2.0	0.16-0.18	7.4-8.4	<4	Moderate	High-----	High-----	0.49		
Rock outcrop part.											
Cruckton:											
21----------	0-11	2.0-6.0	0.07-0.13	6.1-7.3	---	Low-------	Moderate	Moderate	0.10	5	2
	11-28	2.0-6.0	0.10-0.13	6.1-7.3	---	Low-------	Moderate	Low-------	0.10		
	28-60	2.0-6.0	0.07-0.11	6.1-7.3	---	Low-------	Moderate	Low-------	0.10		
Cushman:											
22, 23----------	0-5	0.6-2.0	0.16-0.20	6.6-8.4	---	Low-------	High-----	Low-------	0.32	2	5
	5-23	0.6-2.0	0.14-0.18	6.6-8.4	---	Moderate	High-----	Low-------	0.32		
	23-30	0.6-2.0	0.14-0.18	6.6-8.4	---	Low-------	High-----	Low-------	0.32		
	30	---	---	---	---	----------	---------	---------	---		
124:											
Cushman part----	0-5	0.6-2.0	0.16-0.20	6.6-8.4	---	Low-------	High-----	Low-------	0.32	2	5
	5-23	0.6-2.0	0.14-0.18	6.6-8.4	---	Moderate	High-----	Low-------	0.32		
	23-30	0.6-2.0	0.14-0.18	6.6-8.4	---	Low-------	High-----	Low-------	0.32		
	30	---	---	---	---	----------	---------	---------	---		
Kutch part------	0-10	0.2-0.6	0.15-0.20	6.6-7.8	<2	High------	High-----	Moderate	0.20	2	6
	10-36	0.06-0.2	0.18-0.20	7.4-8.4	<4	High------	High-----	Moderate	0.20		
	36	---	---	---	---	----------	---------	---------	---		
Elbeth:											
25, 26----------	0-23	0.6-2.0	0.11-0.15	5.1-7.3	---	Low-------	High-----	Moderate	0.15	5	3
	23-60	0.6-2.0	0.14-0.16	6.1-7.3	---	Moderate	High-----	Low-------	0.24		
127:											
Elbeth part-----	0-23	0.6-2.0	0.11-0.15	5.1-7.3	---	Low-------	High-----	Moderate	0.15	5	3
	23-60	0.6-2.0	0.14-0.16	6.1-7.3	---	Moderate	High-----	Low-------	0.24		
Pring part------	0-14	2.0-6.0	0.09-0.13	6.1-7.3	---	Low-------	Moderate	Low-------	0.10	5	3
	14-60	6.0-20	0.08-0.12	6.6-7.3	---	Low-------	Moderate	Low-------	0.10		
Ellicott:											
28----------	0-4	6.0-20	0.05-0.08	6.1-7.8	---	Low-------	Moderate	Low-------	0.10	5	2
	4-60	6.0-20	0.05-0.08	6.1-7.8	---	Low-------	Moderate	Low-------	0.10		
Fluvaquentic Haplaquolls:											
29----------	0-60	---	---	---	---	----------	---------	---------	---	---	---
Fort Collins:											
30, 31----------	0-9	0.6-2.0	0.16-0.20	6.6-7.8	<2	Low-------	Moderate	Low-------	0.20	5	6
	9-21	0.6-2.0	0.16-0.18	6.6-7.8	<2	Moderate	Moderate	Low-------	0.20		
	21-60	0.6-2.0	0.16-0.18	7.4-8.4	<2	Moderate	High-----	Low-------	0.20		
Fortwingate:											
132:											
Fortwingate part	0-6	0.6-2.0	0.13-0.18	6.1-7.3	---	Low-------	Moderate	Low-------	0.37	2	---
	6-23	0.06-0.2	0.14-0.16	6.1-7.3	---	High------	High-----	Low-------	0.28		
	23	---	---	---	---	----------	---------	---------	---		
Rock outcrop part.											
Heldt:											
33----------	0-8	0.06-0.2	0.12-0.17	7.9-9.0	2-8	High------	High-----	High-----	0.28	5	4
	8-60	0.06-0.2	0.14-0.16	7.9-9.0	2-8	High------	High-----	High-----	0.28		
Holderness:											
34, 35, 36--------	0-9	0.6-2.0	0.17-0.21	6.6-7.8	---	Low-------	Moderate	Low-------	0.24	5	5
	9-43	0.06-0.2	0.15-0.19	6.6-7.8	---	High------	Moderate	Low-------	0.28		
	43-60	0.2-0.6	0.15-0.19	6.6-7.8	<2	Moderate	High-----	Low-------	0.24		

See footnote at end of table.

TABLE 15.--PHYSICAL AND CHEMICAL PROPERTIES OF SOILS--Continued

Soil name and map symbol	Depth	Permeability	Available water capacity	Soil reaction	Salinity	Shrink-swell potential	Risk of corrosion		Erosion factors		Wind erodibility group
							Uncoated steel	Concrete	K	T	
	In	In/hr	In/in	pH	Mmhos/cm						
Jarre:											
37	0-5	0.6-2.0	0.16-0.18	6.1-7.8	<2	Low	Moderate	Low	0.24	3	5
	5-22	0.6-2.0	0.15-0.17	6.1-7.8	<2	Moderate	Moderate	Low	0.20		
	22-60	2.0-6.0	0.05-0.08	6.1-7.8	<2	Low	Moderate	Low	0.10		
[1]38:											
Jarre part	0-5	0.6-2.0	0.16-0.18	6.1-7.8	<2	Low	Moderate	Low	0.24	3	5
	5-22	0.6-2.0	0.15-0.17	6.1-7.8	<2	Moderate	Moderate	Low	0.20		
	22-60	2.0-6.0	0.05-0.08	6.1-7.8	<2	Low	Moderate	Low	0.10		
Tecolote part	0-3	2.0-6.0	0.06-0.08	6.1-7.3	<2	Low	Moderate	Low	0.17	5	8
	3-29	2.0-6.0	0.06-0.08	6.1-7.3	<2	Low	Moderate	Low	0.17		
	29-45	0.6-2.0	0.06-0.08	6.1-7.3	<2	Low	Moderate	Low	0.17		
	45-60	0.6-2.0	0.04-0.06	6.1-7.3	<2	Low	Moderate	Low	0.17		
Keith:											
39	0-8	0.6-2.0	0.22-0.24	6.6-7.8	---	Low	Moderate	Low	0.32	5	6
	8-30	0.6-2.0	0.20-0.22	6.6-7.8	<2	Moderate	High	Low	0.43		
	30-60	0.6-2.0	0.19-0.21	7.4-8.4	<2	Low	High	Low	0.43		
Kettle:											
40, 41	0-3	6.0-20	0.09-0.16	5.1-6.5	---	Low	Moderate	Low	0.10	5	8
	3-40	6.0-20	0.12-0.15	5.1-6.5	---	Low	Moderate	Low	0.10		
	40-60	6.0-20	0.08-0.14	5.1-6.5	---	Low	Moderate	Low	0.10		
[1]42:											
Kettle part	0-3	6.0-20	0.09-0.16	5.1-6.5	---	Low	Moderate	Low	0.10	5	8
	3-40	6.0-20	0.12-0.15	5.6-6.5	---	Low	Moderate	Low	0.10		
	40-60	6.0-20	0.08-0.14	5.6-6.5	---	Low	Moderate	Low	0.10		
Rock outcrop part.											
Kim:											
43	0-4	0.6-2.0	0.16-0.18	7.4-8.4	<2	Low	Moderate	Low	0.32	5	4L
	4-60	0.6-2.0	0.15-0.17	7.9-8.4	<2	Moderate	Moderate	Low	0.32		
Kutch:											
44, 45	0-5	0.2-0.6	0.15-0.20	6.6-7.8	<2	High	High	Moderate	0.20	2	6
	5-28	0.06-0.2	0.18-0.20	7.4-8.4	<4	High	High	Moderate	0.20		
	28-36	0.06-0.2	0.06-0.08	7.4-8.4	<4	Moderate	High	Moderate	0.15		
	36	---	---	---	---	---	---	---	---		
Kutler:											
[1]46:											
Kutler part	0-6	2.0-6.0	0.07-0.09	6.1-7.3	---	Low	Moderate	Low	0.10	2	8
	6-23	6.0-20	0.05-0.08	6.1-7.3	---	Low	Moderate	Low	0.10		
	23	---	---	---	---	---	---	---	---		
Broadmoor part	0-15	6.0-20	0.06-0.08	5.6-6.5	---	Low	High	Moderate	0.10	2	8
	15-28	6.0-20	0.06-0.08	5.6-6.5	---	Low	High	Moderate	0.10		
	28	---	---	---	---	---	---	---	---		
Rock outcrop part.											
Limon:											
47	0-4	0.2-0.6	0.14-0.17	7.4-8.4	2-8	High	High	Moderate	0.24	5	4
	4-60	0.06-0.2	0.12-0.16	7.9-9.0	2-8	High	High	Moderate	0.32		
Louviers:											
48	0-5	0.2-2.0	0.14-0.21	6.6-7.8	<2	High	Moderate	Low	0.32	1	4
	5-14	0.06-0.2	0.13-0.18	6.6-7.8	<2	High	Moderate	Low	0.37		
	14	---	---	---	---	---	---	---	---		
49	0-5	0.2-2.0	0.14-0.17	6.6-7.8	<2	High	Moderate	Low	0.32	1	8
	5-14	0.06-0.2	0.14-0.17	6.6-7.8	<2	High	Moderate	Low	0.37		
	14	---	---	---	---	---	---	---	---		
Manvel:											
50	0-3	0.6-2.0	0.18-0.20	7.9-9.0	<2	Moderate	High	Moderate	0.37	5	4L
	3-60	0.6-2.0	0.16-0.18	7.9-9.0	2-4	Moderate	High	Moderate	0.43		

See footnote at end of table.

TABLE 15.--PHYSICAL AND CHEMICAL PROPERTIES OF SOILS--Continued

Soil name and map symbol	Depth	Permeability	Available water capacity	Soil reaction	Salinity	Shrink-swell potential	Risk of corrosion: Uncoated steel	Risk of corrosion: Concrete	Erosion factors: K	Erosion factors: T	Wind erodibility group
	In	In/hr	In/in	pH	Mmhos/cm						
Manzanola:											
51, 52, 53	0-6	0.2-0.6	0.15-0.20	7.4-8.4	<2	Moderate	High	Low	0.24	5	6
	6-32	0.06-0.2	0.15-0.18	7.4-8.4	<2	High	High	Low	0.28		
	32-60	0.2-0.6	0.16-0.20	7.4-8.4	<2	Moderate	High	Low	0.24		
Midway:											
54	0-4	0.06-0.2	0.12-0.17	7.9-9.0	2-8	High	High	High	0.43	1	4
	4-13	0.06-0.2	0.14-0.17	7.9-9.0	2-8	High	High	High	0.37		
	13	---	---	---	---	---	---	---	---		
Nederland:											
55	0-5	2.0-6.0	0.07-0.10	6.1-7.8	---	Low	Moderate	Low	0.10	5	8
	5-28	0.6-2.0	0.08-0.12	6.1-7.8	---	Low	Moderate	Low	0.15		
	28-60	2.0-6.0	0.06-0.09	6.1-7.8	<2	Low	Moderate	Low	0.10		
Nelson:											
[1]56:											
Nelson part	0-7	2.0-6.0	0.13-0.15	7.4-8.4	<2	Low	High	Low	0.20	2	3
	7-26	2.0-6.0	0.11-0.13	7.9-8.4	<2	Low	High	Low	0.20		
	26	---	---	---	---	---	---	---	---		
Tassel part	0-10	2.0-6.0	0.16-0.18	7.4-8.4	<2	Low	High	Low	0.24	1	3
	10	---	---	---	---	---	---	---	---		
Neville:											
57	0-10	2.0-6.0	0.13-0.18	7.9-9.0	2-4	Low	High	Low	0.28	5	3
	10-60	0.6-2.0	0.15-0.18	7.9-9.0	2-4	Moderate	High	Low	0.37		
[1]58:											
Neville part	0-10	0.6-6.0	0.13-0.18	7.4-8.4	<2	Low	High	Low	0.28	5	3
	10-60	0.6-2.0	0.15-0.18	7.9-8.4	<2	Moderate	High	Low	0.37		
Rednun part	0-6	0.6-2.0	0.16-0.19	6.6-7.3	---	Low	Moderate	Low	0.28	5	4
	6-29	0.06-0.2	0.15-0.20	7.4-8.4	<2	High	High	Low	0.32		
	29-60	0.2-0.6	0.18-0.21	7.9-8.4	<2	Moderate	High	Low	0.28		
Nunn:											
59	0-12	0.2-0.6	0.15-0.20	6.6-7.8	<2	Moderate	Moderate	Low	0.24	5	6
	12-30	0.06-0.2	0.15-0.18	7.4-8.4	<2	High	High	Low	0.28		
	30-60	0.2-0.6	0.10-0.18	7.4-9.0	<2	Moderate	High	Low	0.24		
Olney:											
60, 61	0-6	2.0-6.0	0.11-0.15	6.6-7.8	<2	Low	Moderate	Low	0.20	5	3
	6-21	0.6-2.0	0.13-0.15	6.6-7.8	<2	Moderate	High	Low	0.24		
	21-60	0.6-2.0	0.11-0.15	7.4-8.4	<2	Low	High	Low	0.24		
[1]62:											
Olney part	0-6	2.0-6.0	0.11-0.15	6.6-7.8	<2	Low	Moderate	Low	0.20	5	3
	6-21	0.6-2.0	0.13-0.15	6.6-7.8	<2	Moderate	High	Low	0.24		
	21-60	0.6-2.0	0.11-0.15	7.4-8.4	<2	Low	High	Low	0.24		
Vona part	0-8	2.0-6.0	0.11-0.13	6.6-7.3	---	Low	Low	Low	0.10	5	3
	8-30	2.0-6.0	0.12-0.14	6.6-8.4	<4	Low	High	Low	0.10		
	30-60	6.0-20	0.08-0.11	7.4-8.4	<4	Low	High	Low	0.10		
Paunsaugunt:											
[1]63:											
Paunsaugunt part	0-6	0.6-2.0	0.12-0.14	7.4-8.4	<2	Low	High	Moderate	0.20	1	8
	6-17	0.6-2.0	0.06-0.08	7.4-8.4	<2	Low	High	Moderate	0.17		
	17	---	---	---	---	---	---	---	---		
Rock outcrop part.											
Penrose:											
[1]64:											
Penrose part	0-11	0.6-2.0	0.14-0.16	7.4-8.4	<2	Low	High	Low	0.10	1	8
	11	---	---	---	---	---	---	---	---		
Manvel part	0-3	0.6-2.0	0.18-0.20	7.9-9.0	<2	Moderate	High	Moderate	0.37	5	4L
	3-60	0.6-2.0	0.16-0.18	7.9-9.0	2-4	Moderate	High	Moderate	0.43		

See footnote at end of table.

TABLE 15.--PHYSICAL AND CHEMICAL PROPERTIES OF SOILS--Continued

Soil name and map symbol	Depth	Permeability	Available water capacity	Soil reaction	Salinity	Shrink-swell potential	Risk of corrosion		Erosion factors		Wind erodibility group
							Uncoated steel	Concrete	K	T	
	In	In/hr	In/in	pH	Mmhos/cm						
Perrypark:											
65	0-4	2.0-6.0	0.12-0.15	6.1-7.8	---	Low	High	Low	0.10	5	3
	4-48	0.6-2.0	0.14-0.16	6.1-7.8	---	Moderate	High	Low	0.17		
	48-60	2.0-6.0	0.09-0.13	6.1-7.8	---	Low	High	Low	0.10		
Peyton:											
66, 67	0-12	2.0-6.0	0.11-0.13	6.1-7.8	---	Low	Moderate	Low	0.10	5	3
	12-25	0.6-2.0	0.15-0.18	6.1-7.8	---	Moderate	Moderate	Low	0.15		
	25-60	0.6-2.0	0.10-0.13	6.1-7.8	---	Low	Moderate	Low	0.10		
[1]68, [1]69:											
Peyton part	0-12	2.0-6.0	0.11-0.13	6.1-7.8	---	Low	Moderate	Low	0.10	5	3
	12-25	0.6-2.0	0.15-0.18	6.1-7.8	---	Moderate	Moderate	Low	0.15		
	25-60	0.6-2.0	0.10-0.13	6.1-7.8	---	Low	Moderate	Low	0.10		
Pring part	0-14	2.0-6.0	0.09-0.13	6.1-7.3	---	Low	Moderate	Low	0.10	5	3
	14-60	6.0-20	0.08-0.12	6.6-7.3	---	Low	Moderate	Low	0.10		
Pits, gravel:											
70.											
Pring:											
71, 72	0-14	2.0-6.0	0.09-0.13	6.1-7.3	---	Low	Moderate	Low	0.10	5	3
	14-60	6.0-20	0.08-0.12	6.6-7.3	---	Low	Moderate	Low	0.10		
Razor:											
73	0-3	0.06-0.2	0.12-0.18	7.4-8.4	<2	Moderate	High	Moderate	0.37	1	6
	3-31	0.06-0.2	0.14-0.17	7.4-8.4	<2	High	High	High	0.37		
	31	---	---	---	---	---	---	---	---		
74	0-4	0.06-0.2	0.12-0.15	7.4-8.4	<4	High	High	Moderate	0.37	3	6
	4-29	0.06-0.2	0.12-0.15	7.4-8.4	<4	High	High	High	0.37		
	29	---	---	---	---	---	---	---	---		
[1]75:											
Razor part	0-3	0.06-0.2	0.12-0.18	7.4-8.4	<2	Moderate	High	Moderate	0.37	1	6
	3-31	0.06-0.2	0.14-0.17	7.4-8.4	<2	High	High	High	0.37		
	31	---	---	---	---	---	---	---	---		
Midway part	0-4	0.06-0.2	0.12-0.17	7.9-9.0	2-8	High	High	High	0.43	1	4
	4-13	0.06-0.2	0.14-0.17	7.9-9.0	2-8	High	High	High	0.37		
	13	---	---	---	---	---	---	---	---		
Rizozo:											
[1]76:											
Rizozo part	0-10	2.0-6.0	0.11-0.16	7.4-8.4	<2	Moderate	Moderate	Moderate	0.32	1	7
	10	---	---	---	---	---	---	---	---		
Neville part	0-10	0.6-6.0	0.13-0.18	7.4-8.4	<2	Low	High	Moderate	0.28	5	3
	10-60	0.6-2.0	0.15-0.18	7.9-8.4	<2	Moderate	High	Moderate	0.37		
Rock outcrop:											
[1]77:											
Rock outcrop part.											
Coldcreek part	0-6	0.6-2.0	0.10-0.16	5.6-7.3	---	Low	High	Low	0.32	3	6
	6-31	0.6-2.0	0.07-0.13	5.6-7.3	---	Low	High	Low	0.28		
	31-43	0.6-2.0	0.07-0.13	5.6-7.3	---	Low	High	Low	0.32		
	43	---	---	---	---	---	---	---	---		
Tolman part	0-4	0.6-2.0	0.14-0.18	6.1-7.8	<2	Low	High	Low	0.32	1	6
	4-13	0.6-2.0	0.12-0.14	6.1-7.8	<2	Low	High	Low	0.28		
	13	---	---	---	---	---	---	---	---		
Sampson:											
78	0-15	0.6-2.0	0.18-0.21	6.6-8.4	---	Moderate	Moderate	Low	0.24	5	5
	15-34	0.6-2.0	0.18-0.21	6.6-8.4	<2	Moderate	Moderate	Low	0.28		
	34-60	0.6-2.0	0.13-0.17	7.4-8.4	<2	Low	Moderate	Low	0.20		

See footnote at end of table.

TABLE 15.--PHYSICAL AND CHEMICAL PROPERTIES OF SOILS--Continued

Soil name and map symbol	Depth	Permeability	Available water capacity	Soil reaction	Salinity	Shrink-swell potential	Risk of corrosion: Uncoated steel	Risk of corrosion: Concrete	Erosion factors: K	Erosion factors: T	Wind erodibility group
	In	In/hr	In/in	pH	Mmhos/cm						
Satanta:											
79, 80	0-9	0.6-2.0	0.20-0.22	6.6-7.8	<2	Low	Moderate	Low	0.28	5-4	5
	9-30	0.6-2.0	0.15-0.19	7.4-8.4	<2	Moderate	High	Low	0.28		
	30-60	0.6-2.0	0.16-0.19	7.4-8.4	<2	Low	High	Low	0.28		
[1]81:											
Satanta part	0-9	0.6-2.0	0.20-0.22	6.6-7.8	<2	Low	Moderate	Low	0.28	5-4	5
	9-30	0.6-2.0	0.15-0.19	7.4-8.4	<2	Moderate	High	Low	0.28		
	30-60	0.6-2.0	0.16-0.19	7.4-8.4	<2	Low	High	Low	0.28		
Neville part	0-10	2.0-6.0	0.13-0.18	7.9-9.0	2-4	Low	High	Low	0.28	5	3
	10-60	0.6-2.0	0.15-0.18	7.9-9.0	2-4	Moderate	High	Low	0.37		
Schamber:											
[1]82:											
Schamber part	0-14	6.0-20	0.03-0.18	6.6-8.4	<2	Low	Moderate	Low	0.17	2	8
	14-60	6.0-20	0.03-0.06	7.9-8.4	<2	Low	Moderate	Low	0.10		
Razor part	0-3	0.06-0.2	0.12-0.18	7.4-8.4	<2	Moderate	High	Moderate	0.37	1	6
	3-31	0.06-0.2	0.14-0.17	7.4-8.4	<2	High	High	High	0.37		
	31	---	---	---	---	---	---	---	---		
Stapleton:											
83, 84	0-26	6.0-20	0.07-0.09	6.1-7.3	---	Low	Moderate	Low	0.10	5	3
	26-60	6.0-20	0.05-0.09	6.1-7.3	---	Low	Moderate	Low	0.10		
[1]85:											
Stapleton part	0-26	6.0-20	0.07-0.09	6.1-7.3	---	Low	Moderate	Low	0.10	5	3
	26-60	6.0-20	0.05-0.09	6.1-7.3	---	Low	Moderate	Low	0.10		
Bernal part	0-4	0.6-2.0	0.13-0.16	6.6-7.8	<2	Moderate	Moderate	Low	0.28	1	5
	4-13	0.6-2.0	0.13-0.16	6.6-7.8	<2	Moderate	Moderate	Low	0.24		
	13	---	---	---	---	---	---	---	---		
Stoneham:											
86, 87	0-4	2.0-6.0	0.11-0.15	6.6-7.8	<2	Low	Moderate	Low	0.17	5	3
	4-16	0.6-2.0	0.14-0.18	7.4-8.4	<2	Moderate	Moderate	Low	0.20		
	16-60	0.6-2.0	0.11-0.18	7.9-9.0	<2	Low	High	Low	0.20		
Stroupe:											
[1]88:											
Stroupe part	0-8	0.6-2.0	0.05-0.07	6.6-7.8	<2	Low	Moderate	Low	0.24	2	---
	8-35	0.06-0.2	0.07-0.09	7.4-8.4	<2	Moderate	High	Low	0.24		
	35	---	---	---	---	---	---	---	---		
Travessilla part	0-11	2.0-6.0	0.06-0.12	7.4-8.4	<2	Low	High	Low	0.37	1	---
	11	---	---	---	---	---	---	---	---		
Rock outcrop part.											
Tassel:											
89	0-10	2.0-6.0	0.16-0.18	7.4-8.4	<2	Low	High	Low	0.24	1	3
	10	---	---	---	---	---	---	---	---		
Terry:											
90	0-5	2.0-6.0	0.13-0.15	6.6-8.4	<2	Low	Moderate	Low	0.20	2	3
	5-23	2.0-6.0	0.13-0.15	6.6-8.4	<2	Low	Moderate	Low	0.20		
	23	---	---	---	---	---	---	---	---		
[1]91:											
Terry part	0-5	2.0-6.0	0.13-0.15	6.6-8.4	<2	Low	Moderate	Low	0.20	2	3
	5-23	2.0-6.0	0.13-0.15	6.6-8.4	<2	Low	Moderate	Low	0.20		
	23	---	---	---	---	---	---	---	---		
Razor part	0-3	0.06-0.2	0.12-0.18	7.4-8.4	<2	Moderate	High	Moderate	0.37	1	6
	3-31	0.06-0.2	0.14-0.17	7.4-8.4	<2	High	High	High	0.37		
	31	---	---	---	---	---	---	---	---		

See footnote at end of table.

TABLE 15.--PHYSICAL AND CHEMICAL PROPERTIES OF SOILS--Continued

Soil name and map symbol	Depth	Permeability	Available water capacity	Soil reaction	Salinity	Shrink-swell potential	Risk of corrosion		Erosion factors		Wind erodibility group
							Uncoated steel	Concrete	K	T	
	In	In/hr	In/in	pH	Mmhos/cm						
Tomah:											
[1]92, [1]93:											
Tomah part------	0-10	2.0-6.0	0.13-0.15	5.6-7.3	---	Low-------	Moderate	Low------	0.17	5	3
	10-22	6.0-20	0.06-0.08	5.6-7.3	---	Low-------	Moderate	Low------	0.15		
	22-48	2.0-6.0	0.11-0.16	5.6-7.3	---	Low-------	Moderate	Low------	0.17		
	48-60	6.0-20	0.06-0.08	5.6-7.3	---	Low-------	Moderate	Low------	0.10		
Crowfoot part---	0-12	2.0-6.0	0.11-0.13	6.1-7.3	---	Low-------	Moderate	Low------	0.17	5	3
	12-23	6.0-20	0.06-0.08	6.1-7.3	---	Low-------	Moderate	Low------	0.17		
	23-36	0.6-2.0	0.17-0.19	6.1-7.3	---	Moderate	Moderate	Low------	0.32		
	36-60	2.0-6.0	0.11-0.13	6.1-7.3	---	Low-------	Moderate	Low------	0.10		
Travessilla:											
[1]94:											
Travessilla part	0-11	2.0-6.0	0.06-0.12	6.6-8.4	<2	Low-------	Moderate	Low------	0.37	1	---
	11	---	---	---	---	----------	---------	---------	---		
Rock outcrop part.											
Truckton:											
95, 96, 97--------	0-8	2.0-6.0	0.07-0.13	6.6-7.8	---	Low-------	Moderate	Moderate	0.10	5	2
	8-24	2.0-6.0	0.10-0.13	6.6-7.8	---	Low-------	Moderate	Low------	0.10		
	24-60	2.0-6.0	0.07-0.11	6.6-7.8	---	Low-------	Moderate	Low------	0.10		
[1]98:											
Truckton part---	0-8	2.0-6.0	0.07-0.13	6.6-7.8	---	Low-------	Moderate	Moderate	0.10	5	2
	8-24	2.0-6.0	0.10-0.13	6.6-7.8	---	Low-------	Moderate	Low------	0.10		
	24-60	2.0-6.0	0.07-0.11	6.6-7.8	---	Low-------	Moderate	Low------	0.10		
Blakeland part--	0-11	6.0-20	0.06-0.09	6.1-7.3	---	Low-------	Moderate	Low------	0.10	5	2
	11-60	6.0-20	0.05-0.08	6.6-7.3	---	Low-------	Moderate	Low------	0.10		
[1]99, [1]100:											
Truckton part---	0-8	2.0-6.0	0.07-0.13	6.6-7.8	---	Low-------	Moderate	Moderate	0.10	5	2
	8-24	2.0-6.0	0.10-0.13	6.6-7.8	---	Low-------	Moderate	Low------	0.10		
	24-60	2.0-6.0	0.07-0.11	6.6-7.8	---	Low-------	Moderate	Low------	0.10		
Bresser part----	0-8	0.6-6.0	0.11-0.13	6.1-7.3	---	Low-------	Moderate	Low------	0.10	5	2
	8-27	0.6-2.0	0.15-0.18	6.6-7.3	---	Moderate	Moderate	Low------	0.15		
	27-36	0.6-6.0	0.10-0.13	6.6-7.3	---	Low-------	Moderate	Low------	0.10		
	36-60	2.0-20	0.05-0.08	6.6-7.3	---	Low-------	Moderate	Low------	0.10		
Ustic Torrifluvents:											
101---------------	0-60	---	---	---	---	----------	---------	---------	---	---	---
Valent:											
102, 103----------	0-6	6.0-20	0.05-0.10	6.6-7.3	---	Low-------	Moderate	Low------	0.10	5	1
	6-60	6.0-20	0.05-0.10	6.6-7.8	<2	Low-------	Moderate	Low------	0.10		
Vona:											
104, 105----------	0-7	2.0-6.0	0.11-0.13	6.6-7.3	---	Low-------	Moderate	Low------	0.10	5	3
	7-40	2.0-6.0	0.12-0.14	6.6-8.4	<4	Low-------	High------	Low------	0.10		
	40-60	6.0-20	0.08-0.11	7.4-8.4	<4	Low-------	High------	Low------	0.10		
Wigton:											
106---------------	0-19	6.0-20	0.06-0.10	6.6-7.8	<2	Low-------	Moderate	Low------	0.10	5	2
	19-60	6.0-20	0.04-0.08	6.6-7.8	<2	Low-------	Moderate	Low------	0.10		
Wiley:											
107, 108----------	0-5	0.6-2.0	0.19-0.21	7.4-8.4	<2	Low-------	High------	Low------	0.37	5	4L
	5-23	0.6-2.0	0.19-0.21	7.4-8.4	<2	Moderate	High------	Low------	0.37		
	23-60	0.6-2.0	0.16-0.21	7.9-9.0	<2	Moderate	High------	Low------	0.49		
Yoder:											
109, 110----------	0-6	2.0-20	0.07-0.12	6.1-7.3	---	Low-------	Moderate	Low------	0.10	2	5
	6-12	2.0-6.0	0.10-0.16	6.1-7.3	---	Low-------	Moderate	Low------	0.15		
	12-60	6.0-20	0.04-0.08	6.1-7.3	---	Low-------	Moderate	Low------	0.10		

[1]This map unit is made up of two or more dominant kinds of soil. See map unit description for the composition and behavior characteristics of the map unit.

TABLE 16.--SOIL AND WATER FEATURES

[Absence of an entry indicates the feature is not a concern. See "flooding" in Glossary for definition of terms as "rare," "brief," and "very brief." The symbol > means greater than]

Soil name and map symbol	Hydrologic group	Flooding			Bedrock		Potential frost action
		Frequency	Duration	Months	Depth	Hardness	
					In		
Alamosa: 1	C	Frequent	Brief	May-Jun	>60	---	High.
Ascalon: 2, 3	B	None	---	---	>60	---	Moderate.
Badland: 4	D	---	---	---	---	---	---
Bijou: 5, 6, 7	B	None	---	---	>60	---	Low.
Blakeland: 8	A	None	---	---	>60	---	Low.
[1]9: Blakeland part	A	None	---	---	>60	---	Low.
Fluvaquentic Haplaquolls part	D	Common	Very brief	Mar-Aug	>60	---	High.
Blendon: 10	B	None	---	---	>60	---	Moderate.
Bresser: 11, 12, 13	B	None	---	---	>60	---	Low.
Brussett: 14, 15	B	None	---	---	>60	---	Moderate.
Chaseville: 16, 17	A	None	---	---	>60	---	Low.
[1]18: Chaseville part	A	None	---	---	>60	---	Low.
Midway part	D	None	---	---	10-20	Rippable	Moderate.
Columbine: 19	A	None to rare	---	---	>60	---	Low.
Connerton: [1]20: Connerton part	B	None	---	---	>60	---	High.
Rock outcrop part	D	---	---	---	---	---	---
Cruckton: 21	B	None	---	---	>60	---	Moderate.
Cushman: 22, 23	C	None	---	---	20-40	Rippable	Moderate.
[1]24: Cushman part	C	None	---	---	20-40	Rippable	Moderate.
Kutch part	C	None	---	---	20-40	Rippable	Moderate.
Elbeth: 25, 26	B	None	---	---	>60	---	Moderate.
[1]27: Elbeth part	B	None	---	---	>60	---	Moderate.

See footnote at end of table.

TABLE 16.--SOIL AND WATER FEATURES--Continued

Soil name and map symbol	Hydrologic group	Flooding			Bedrock		Potential frost action
		Frequency	Duration	Months	Depth	Hardness	
					In		
Elbeth:							
Pring part-----	B	None----------	---	---	>60	---	Moderate.
Ellicott:							
28----------	A	Frequent------	Brief---------	Mar-Jun	>60	---	Low.
Fluvaquentic Haplaquolls:							
29----------	B/D	Frequent------	Brief---------	Mar-Jul	>60	---	High.
Fort Collins:							
30, 31----------	B	None to rare	---	---	>60	---	Moderate.
Fortwingate:							
[1]32:							
Fortwingate part----------	C	None----------	---	---	20-40	Hard	Low.
Rock outcrop part----------	D	---	---	---	---	---	---
Heldt:							
33----------	C	None----------	---	---	>60	---	Moderate.
Holderness:							
34, 35, 36-------	C	None----------	---	---	>60	---	Moderate.
Jarre:							
37----------	B	None----------	---	---	>60	---	Moderate.
[1]38:							
Jarre part-----	B	None----------	---	---	>60	---	Moderate.
Tecolote part--	B	None----------	---	---	>60	---	Moderate.
Keith:							
39----------	B	None----------	---	---	>60	---	High.
Kettle:							
40, 41----------	B	None----------	---	---	>60	---	Moderate.
[1]42:							
Kettle part----	B	None----------	---	---	>60	---	Moderate.
Rock outcrop part----------	D	---	---	---	---	---	---
Kim:							
43----------	B	None----------	---	---	>60	---	Moderate.
Kutch:							
44, 45----------	C	None----------	---	---	20-40	Rippable	Moderate.
Kutler:							
[1]46:							
Kutler part----	C	None----------	---	---	20-40	Rippable	Low.
Broadmoor part-	C	None----------	---	---	20-40	Rippable	Low.
Rock outcrop part----------	D	---	---	---	---	---	---
Limon:							
47----------	C	Occasional----	Brief---------	May-Sep	>60	---	Moderate.
Louviers:							
48----------	D	None----------	---	---	10-20	Rippable	Moderate.
49----------	D	None----------	---	---	10-20	Rippable	Low.

See footnote at end of table.

TABLE 16.--SOIL AND WATER FEATURES--Continued

Soil name and map symbol	Hydrologic group	Flooding			Bedrock		Potential frost action
		Frequency	Duration	Months	Depth	Hardness	
					In		
Manvel:							
50	C	None	---	---	>60	---	High.
Manzanola:							
51, 52, 53	C	None to rare	---	---	>60	---	Moderate.
Midway:							
54	D	None	---	---	10-20	Rippable	Moderate.
Nederland:							
55	B	None	---	---	>60	---	Moderate.
Nelson:							
[1]56:							
Nelson part	B	None	---	---	20-40	Rippable	Low.
Tassel part	D	None	---	---	10-20	Rippable	Low.
Neville:							
57	B	None	---	---	>60	---	High.
[1]58:							
Neville part	B	None	---	---	>60	---	High.
Rednun part	C	None	---	---	>60	---	Moderate.
Nunn:							
59	C	None	---	---	>60	---	Moderate.
Olney:							
60, 61	B	None	---	---	>60	---	Moderate.
[1]62:							
Olney part	B	None	---	---	>60	---	Moderate.
Vona part	B	None	---	---	>60	---	Moderate.
Paunsaugunt:							
[1]63:							
Paunsaugunt part	D	None	---	---	10-20	Hard	Moderate.
Rock outcrop part	D	---	---	---	---	---	---
Penrose:							
[1]64:							
Penrose part	D	None	---	---	10-20	Rippable	Low.
Manvel part	C	None	---	---	>60	---	High.
Perrypark:							
65	B	None	---	---	>60	---	Moderate.
Peyton:							
66, 67	B	None	---	---	>60	---	Moderate.
[1]68, [1]69:							
Peyton part	B	None	---	---	>60	---	Moderate.
Pring part	B	None	---	---	>60	---	Moderate.
Pits, gravel:							
70	A	---	---	---	---	---	---
Pring:							
71, 72	B	None	---	---	>60	---	Moderate.
Razor:							
73, 74	C	None	---	---	20-40	Rippable	Moderate.

See footnote at end of table.

TABLE 16.--SOIL AND WATER FEATURES--Continued

Soil name and map symbol	Hydrologic group	Flooding			Bedrock		Potential frost action
		Frequency	Duration	Months	Depth	Hardness	
					In		
Razor:							
[1]75:							
Razor part-----	C	None----------	---	---	20-40	Rippable	Moderate.
Midway part----	D	None----------	---	---	10-20	Rippable	Moderate.
Rizozo:							
[1]76:							
Rizozo part----	D	None----------	---	---	4-20	Hard	Low.
Neville part---	B	None----------	---	---	>60	---	High.
Rock outcrop:							
[1]77:							
Rock outcrop part----------	D	---	---	---	---	---	---
Coldcreek part-	B	None----------	---	---	40-60	Rippable	Moderate.
Tolman part----	D	None----------	---	---	10-20	Hard	Moderate.
Sampson:							
78----------	B	None----------	---	---	>60	---	Moderate.
Satanta:							
79, 80----------	B	None----------	---	---	>60	---	Moderate.
[1]81:							
Satanta part---	B	None----------	---	---	>60	---	Moderate.
Neville part---	B	None----------	---	---	>60	---	High.
Schamber:							
[1]82:							
Schamber part--	A	None----------	---	---	>60	---	Moderate.
Razor part-----	C	None----------	---	---	20-40	Rippable	Moderate.
Stapleton:							
83, 84----------	B	None----------	---	---	>60	---	Moderate.
[1]85:							
Stapleton part-	B	None----------	---	---	>60	---	Moderate.
Bernal part----	D	None----------	---	---	8-20	Hard	Moderate.
Stoneham:							
86, 87----------	B	None----------	---	---	>60	---	Moderate.
Stroupe:							
[1]88:							
Stroupe part---	C	None----------	---	---	20-40	Hard	Moderate.
Travessilla part----------	D	None----------	---	---	6-20	Hard	Low.
Rock outcrop part----------	D	---	---	---	---	---	---
Tassel:							
89----------	D	None----------	---	---	10-20	Rippable	Low.
Terry:							
90----------	B	None----------	---	---	20-40	Rippable	Moderate.
[1]91:							
Terry part-----	B	None----------	---	---	20-40	Rippable	Moderate.
Razor part-----	C	None----------	---	---	20-40	Rippable	Moderate.

See footnote at end of table.

TABLE 16.--SOIL AND WATER FEATURES--Continued

Soil name and map symbol	Hydrologic group	Flooding			Bedrock		Potential frost action
		Frequency	Duration	Months	Depth	Hardness	
					In		
Tomah: [1]92, [1]93:							
Tomah part	B	None	---	---	>60	---	Moderate.
Crowfoot part	B	None	---	---	>60	---	Moderate.
Travessilla: [1]94:							
Travessilla part	D	None	---	---	6-20	Hard	Low.
Rock outcrop part	D	---	---	---	---	---	---
Truckton: 95, 96, 97	B	None	---	---	>60	---	Moderate.
[1]98:							
Truckton part	B	None	---	---	>60	---	Moderate.
Blakeland part	A	None	---	---	>60	---	Low.
[1]99, [1]100:							
Truckton part	B	None	---	---	>60	---	Moderate.
Bresser part	B	None	---	---	>60	---	Low.
Ustic Torrifluvents: 101	B	Occasional	Very brief	Mar-Aug	>60	---	Moderate.
Valent: 102, 103	A	None	---	---	>60	---	Low.
Vona: 104, 105	B	None	---	---	>60	---	Moderate.
Wigton: 106	A	None	---	---	>60	---	Low.
Wiley: 107, 108	B	None	---	---	>60	---	Low.
Yoder: 109, 110	B	None	---	---	>60	---	Low.

[1]This map unit is made up of two or more dominant kinds of soil. See map unit description for the composition and behavior characteristics of the map unit.

TABLE 17.--CLASSIFICATION OF THE SOILS

Soil name	Family or higher taxonomic class
Alamosa	Fine-loamy, mixed, frigid Typic Argiaquolls
Ascalon	Fine-loamy, mixed, mesic Aridic Argiustolls
Bernal	Loamy, mixed, mesic Lithic Argiustolls
Bijou	Coarse-loamy, mixed, mesic Ustollic Haplargids
Blakeland	Sandy, mixed, mesic Torriorthentic Haplustolls
Blendon	Coarse-loamy, mixed, mesic Pachic Haplustolls
Bresser	Fine-loamy, mixed, mesic Aridic Argiustolls
Broadmoor	Loamy-skeletal, mixed, frigid Udic Ustochrepts
Brussett	Fine-silty, mixed Aridic Argiborolls
Chaseville	Sandy-skeletal, mixed, mesic Torriorthentic Haplustolls
Coldcreek	Loamy-skeletal, mixed Typic Paleboralfs
Columbine	Sandy-skeletal, mixed, mesic Torriorthentic Haplustolls
Connerton	Fine-loamy, mixed, mesic Torriorthentic Haplustolls
Crowfoot	Fine-loamy, mixed Boralfic Argiborolls
Cruckton	Coarse-loamy, mixed Aridic Argiborolls
Cushman	Fine-loamy, mixed, mesic Ustollic Haplargids
Elbeth	Fine-loamy, mixed Typic Eutroboralfs
Ellicott	Sandy, mixed, mesic Ustic Torrifluvents
Fluvaquentic Haplaquolls	Fluvaquentic Haplaquolls
Fort Collins	Fine-loamy, mixed, mesic Ustollic Haplargids
Fortwingate	Fine, montmorillonitic Typic Eutroboralfs
Heldt	Fine, montmorillonitic, mesic Ustertic Camborthids
Holdernesse	Fine, montmorillonitic Aridic Argiborolls
Jarre	Fine-loamy, mixed Aridic Argiborolls
Keith	Fine-silty, mixed, mesic Aridic Argiustolls
Kettle	Coarse-loamy, mixed Psammentic Eutroboralfs
Kim	Fine-loamy, mixed (calcareous), mesic Ustic Torriorthents
Kutch	Fine, montmorillonitic, mesic Torrertic Argiustolls
Kutler	Loamy-skeletal, mixed Entic Haploborolls
Limon	Fine, montmorillonitic (calcareous), mesic Ustertic Torriorthents
Louviers	Clayey, montmorillonitic, nonacid, mesic, shallow Ustic Torriorthents
Manvel	Fine-silty, mixed (calcareous), mesic Ustic Torriorthents
Manzanola	Fine, montmorillonitic, mesic Ustollic Haplargids
Midway	Clayey, montmorillonitic (calcareous), mesic, shallow Ustic Torriorthents
Nederland	Loamy-skeletal, mixed, mesic Aridic Argiustolls
Nelson	Coarse-loamy, mixed (calcareous), mesic Ustic Torriorthents
Neville	Fine-loamy, mixed (calcareous), mesic Ustic Torriorthents
Nunn	Fine, montmorillonitic, mesic Aridic Argiustolls
Olney	Fine-loamy, mixed, mesic Ustollic Haplargids
Paunsaugunt	Loamy-skeletal, mixed Lithic Haploborolls
Penrose	Loamy, mixed (calcareous), mesic Lithic Ustic Torriorthents
Perrypark	Fine-loamy, mixed Aridic Argiborolls
Peyton	Fine-loamy, mixed Aridic Argiborolls
Pring	Coarse-loamy, mixed Aridic Haploborolls
Razor	Fine, montmorillonitic, mesic Ustollic Camborthids
Rednun	Fine, montmorillonitic, mesic Aridic Argiustolls
Rizozo	Loamy, mixed (calcareous), mesic Lithic Ustic Torriorthents
Sampson	Fine-loamy, mixed, mesic Pachic Argiustolls
Satanta	Fine-loamy, mixed, mesic Aridic Argiustolls
Schamber	Sandy-skeletal, mixed, mesic Ustic Torriorthents
Stapleton	Coarse-loamy, mixed, mesic Aridic Haplustolls
Stoneham	Fine-loamy, mixed, mesic Ustollic Haplargids
Stroupe	Clayey-skeletal, mixed, mesic Aridic Argiustolls
Tassel	Loamy, mixed (calcareous), mesic, shallow Ustic Torriorthents
Tecolote	Loamy-skeletal, mixed Typic Eutroboralfs
Terry	Coarse-loamy, mixed, mesic Ustollic Haplargids
Tolman	Loamy-skeletal, mixed Lithic Argiborolls
Tomah	Coarse-loamy, mixed Boralfic Argiborolls
Travessilla	Loamy, mixed (calcareous), mesic Lithic Ustic Torriorthents
Truckton	Coarse-loamy, mixed, mesic Aridic Argiustolls
Ustic Torrifluvents	Ustic Torrifluvents
Valent	Mixed, mesic Ustic Torripsamments
Vona	Coarse-loamy, mixed, mesic Ustollic Haplargids
Wigton	Mixed, mesic Ustic Torripsamments
Wiley	Fine-silty, mixed, mesic Ustollic Haplargids
Yoder	Fine-loamy over sandy or sandy-skeletal, mixed, mesic Ustollic Haplargids

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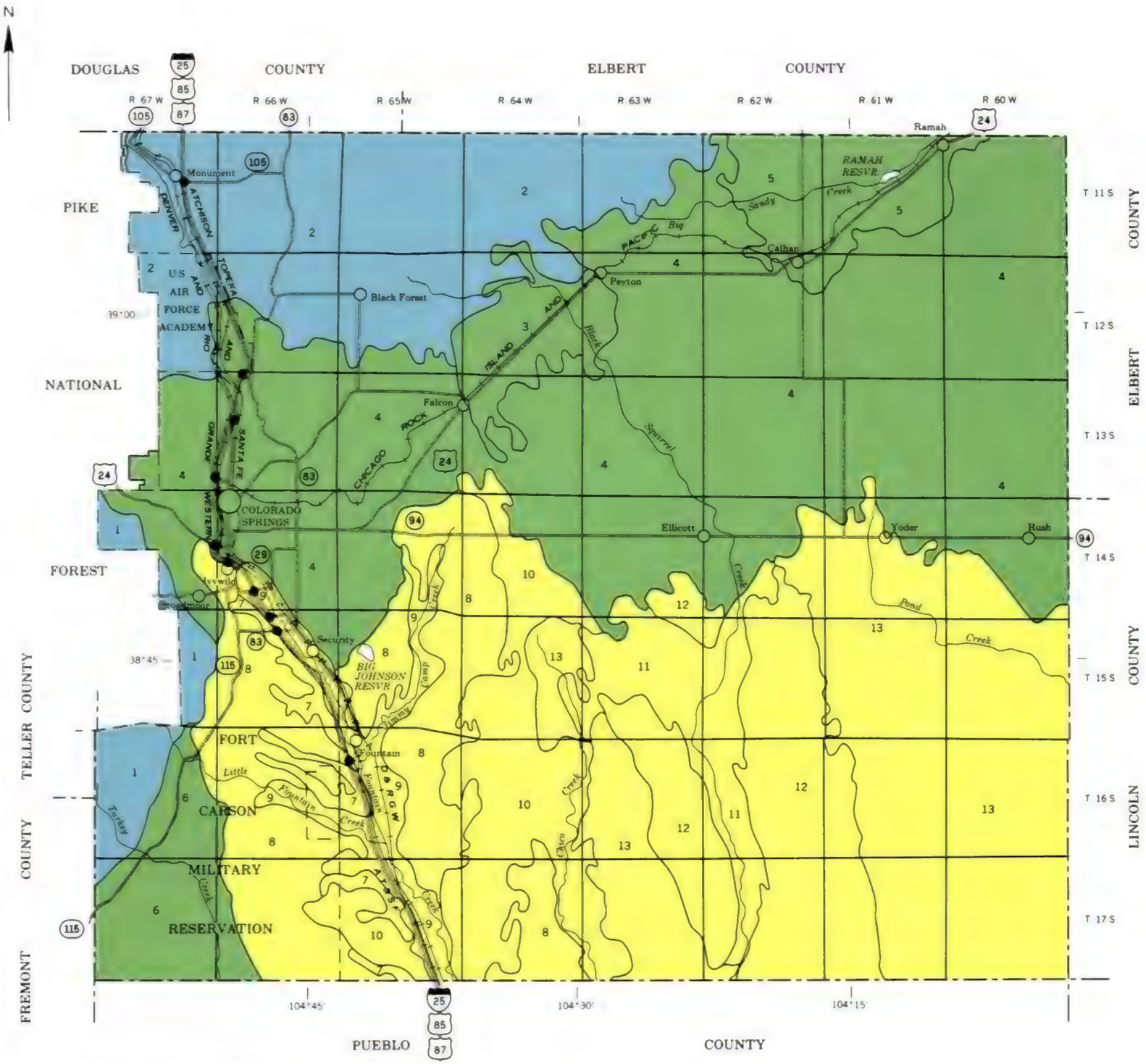


MAP UNITS*

SOILS ON COLD, SUBHUMID TO SEMIARID MOUNTAINS AND FOOTHILLS

1 Coldcreek-Rock outcrop-Kutler. Rock outcrop and deep and moderately deep, strongly sloping to extremely steep, well drained and somewhat excessively drained soils that formed in material weathered from acid igneous rock

2 Kettle-Pring-Peyton. Deep, nearly level to steep, well drained soils that formed in material weathered from arkosic sedimentary rock

SOILS ON MILD, SEMIARID FOOTHILLS AND PLAINS

3 Columbine-Stapleton. Deep, nearly level to strongly sloping, well drained, gravelly soils that formed in sandy alluvium derived from arkosic sedimentary rock

4 Truckton-Blakeland-Bresser. Deep, nearly level to moderately steep, sandy soils that formed in material weathered from arkosic sedimentary rock

5 Cushman-Bresser. Moderately deep and deep, nearly level to strongly sloping soils that formed in material derived from interbedded sandstone and shale and from arkosic sedimentary rock

6 Neville-Nederland-Rizozo. Deep and shallow, gently sloping to moderately steep, well drained soils that formed in alluvium and residuum derived from red sandstone and in cobbly and gravelly alluvium

SOILS ON MILD, SEMIARID TO ARID PLAINS

7 Schamber-Razor. Deep and moderately deep, gently rolling to steep, well drained soils that formed in material weathered from gravelly alluvium and in residuum derived from shale

8 Razor-Midway. Moderately deep and shallow, gently sloping to moderately steep, well drained soils that formed in material derived from calcareous shale

9 Manzanola-Limon. Deep, nearly level to gently sloping, well drained soils that formed in calcareous alluvium

10 Stoneham-Ascalon-Fort Collins. Deep, nearly level to strongly sloping, well drained soils that formed in mixed alluvial and eolian material

11 Bijou-Wigton. Deep, nearly level to moderately sloping, well drained and excessively drained soils that formed in noncalcareous, sandy alluvial and eolian material

12 Valent-Wigton. Deep, nearly level to hilly, excessively drained soils that formed in sandy eolian material

13 Olney-Vona. Deep, nearly level to moderately sloping, well drained soils that formed in calcareous sandy sediment

*The terms for texture used in the descriptive heading apply to the surface layer of the major soils.

Compiled 1979

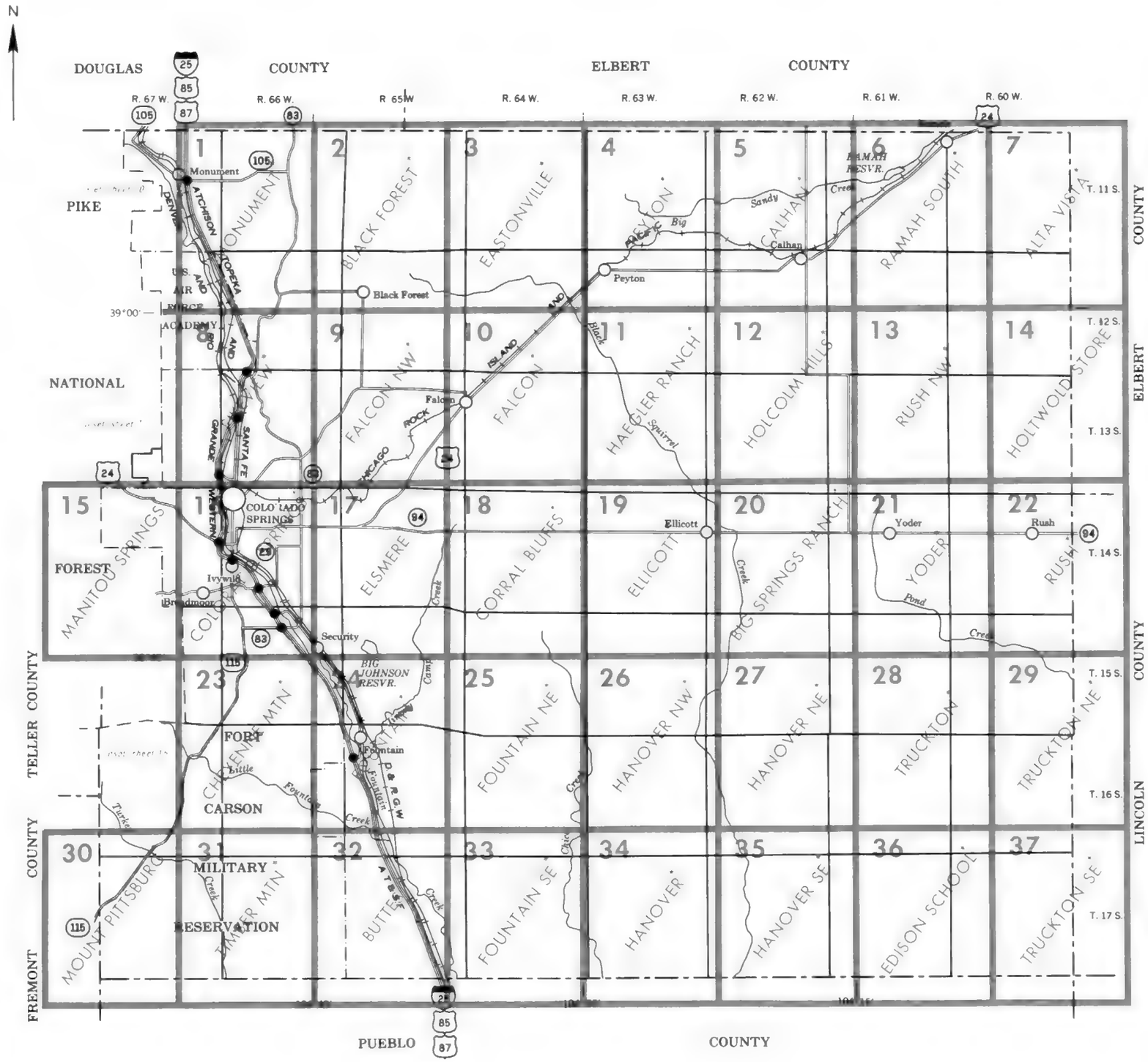
U.S. DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE
COLORADO AGRICULTURAL EXPERIMENT STATION

GENERAL SOIL MAP

EL PASO COUNTY AREA, COLORADO

Scale 1: 380,160
1 0 1 2 3 4 5 Miles

Each area outlined on this map consists of more than one kind of soil. The map is thus meant for general planning rather than a basis for decisions on the use of specific tracts.



* QUADRANGLE NAME

INDEX TO MAP SHEETS

EL PASO COUNTY AREA, COLORADO

Scale 1: 380,160

1 0 1 2 3 4 5 Miles

CONVENTIONAL AND SPECIAL SYMBOLS LEGEND

SOIL LEGEND

SYMBOL	NAME
1	Alamosa loam, 1 to 3 percent slopes
2	Ascalon sandy loam, 1 to 3 percent slopes
3	Ascalon sandy loam, 3 to 9 percent slopes
4	Badland
5	Bijou loamy sand, 1 to 8 percent slopes
6	Bijou sandy loam, 1 to 3 percent slopes
7	Bijou sandy loam, 3 to 8 percent slopes
8	Blakeland loamy sand, 1 to 9 percent slopes
9	Blakeland complex, 1 to 9 percent slopes
10	Blendon sandy loam, 0 to 3 percent slopes
11	Bresser sandy loam, 0 to 3 percent slopes
12	Bresser sandy loam, 3 to 5 percent slopes
13	Bresser sandy loam, 5 to 9 percent slopes
14	Brussett loam, 1 to 3 percent slopes
15	Brussett loam, 3 to 5 percent slopes
16	Chaseville gravelly sandy loam, 1 to 8 percent slopes
17	Chaseville gravelly sandy loam, 8 to 40 percent slopes
18	Chaseville-Midway complex
19	Columbine gravelly sandy loam, 0 to 3 percent slopes
20	Connerton-Rock outcrop complex, 8 to 90 percent slopes
21	Cruckton sandy loam, 1 to 9 percent slopes
22	Cushman loam, 1 to 5 percent slopes
23	Cushman loam, 5 to 15 percent slopes
24	Cushman-Kutch complex, 3 to 12 percent slopes
25	Elbeth sandy loam, 3 to 8 percent slopes
26	Elbeth sandy loam, 8 to 15 percent slopes
27	Elbeth-Pring complex, 5 to 30 percent slopes
28	Ellicott loamy coarse sand, 0 to 5 percent slopes
29*	Fluvaquentic Haplaquolls, nearly level
30	Fort Collins loam, 0 to 3 percent slopes
31	Fort Collins loam, 3 to 8 percent slopes
32	Fortwingate-Rock outcrop complex, 15 to 60 percent slopes
33	Heldt clay loam, 0 to 3 percent slopes
34	Holderness loam, 1 to 5 percent slopes
35	Holderness loam, 5 to 8 percent slopes
36	Holderness loam, 8 to 15 percent slopes
37	Jarre gravelly sandy loam, 1 to 8 percent slopes
38	Jarre Tecolote complex, 8 to 65 percent slopes
39	Keith silt loam, 0 to 3 percent slopes
40	Kettle gravelly loamy sand, 3 to 8 percent slopes
41	Kettle gravelly loamy sand, 8 to 40 percent slopes
42	Kettle-Rock outcrop complex
43	Kim loam, 1 to 8 percent slopes
44	Kutch clay loam, 3 to 5 percent slopes
45	Kutch clay loam, 5 to 20 percent slopes
46	Kutler-Broadmoor-Rock outcrop complex, 25 to 90 percent slopes
47	Limon clay, 0 to 3 percent slopes
48	Louviers silty clay loam, 3 to 18 percent slopes
49	Louviers cobbly clay loam, 5 to 40 percent slopes
50	Manvel loam, 3 to 9 percent slopes
51	Manzanola clay loam, 0 to 1 percent slopes
52	Manzanola clay loam, 1 to 3 percent slopes
53	Manzanola clay loam, 3 to 9 percent slopes
54	Midway clay loam, 3 to 25 percent slopes
55	Nederland cobbly sandy loam, 9 to 25 percent slopes
56	Nelson-Tassel fine sandy loams, 3 to 18 percent slopes
57	Neville fine sandy loam, 3 to 9 percent slopes
58	Neville-Rednun complex, 3 to 9 percent slopes
59	Nunn clay loam, 0 to 3 percent slopes
60	Olney sandy loam, 0 to 3 percent slopes
61	Olney sandy loam, 3 to 5 percent slopes
62	Olney and Vona soils, eroded
63	Paunsaugunt-Rock outcrop complex, 15 to 65 percent slopes
64	Penrose-Manvel complex, 3 to 45 percent slopes
65	Perrypark gravelly sandy loam, 3 to 9 percent slopes
66	Peyton sandy loam, 1 to 5 percent slopes
67	Peyton sandy loam, 5 to 9 percent slopes
68	Peyton-Pring complex, 3 to 8 percent slopes
69	Peyton-Pring complex, 8 to 15 percent slopes
70	Pits, gravel
71	Pring coarse sandy loam, 3 to 8 percent slopes
72	Pring coarse sandy loam, 8 to 15 percent slopes
73	Razor clay loam, 3 to 9 percent slopes
74	Razor stony clay loam, 5 to 15 percent slopes, clay loams
75	Razor-Midway complex
76	Rizozo-Neville complex, 3 to 30 percent slopes
77	Rock outcrop-Coldcreek-Tolman complex, 9 to 90 percent slopes
78	Sampson loam, 0 to 3 percent slopes
79	Santanta loam, 0 to 3 percent slopes
80	Santanta loam, 3 to 5 percent slopes
81	Santanta-Neville complex, 3 to 8 percent slopes
82	Schamber-Razor complex, 8 to 50 percent slopes
83	Stapleton sandy loam, 3 to 8 percent slopes
84	Stapleton sandy loam, 8 to 15 percent slopes
85	Stapleton-Bernal sandy loams, 3 to 20 percent slopes
86	Stoneham sandy loam, 3 to 8 percent slopes
87	Stoneham sandy loam, 8 to 15 percent slopes
88	Stroupe-Travessilla-Rock outcrop complex, 9 to 90 percent slopes
89	Tassel fine sandy loam, 3 to 18 percent slopes
90	Terry sandy loam, 1 to 8 percent slopes
91	Terry-Razor complex, 3 to 20 percent slopes
92	Tomah-Crowfoot loamy sands, 3 to 8 percent slopes
93	Tomah-Crowfoot loamy sands, 8 to 15 percent slopes
94	Travessilla Rock outcrop complex, 8 to 90 percent slopes
95	Truckton loamy sand, 1 to 9 percent slopes
96	Truckton sandy loam, 0 to 3 percent slopes
97	Truckton sandy loam, 3 to 9 percent slopes
98	Truckton Blakeland complex, 9 to 20 percent slopes
99	Truckton-Bresser complex, 5 to 20 percent slopes
100	Truckton Bresser complex, eroded
101*	Ustic Torrifluvents, loamy
102	Valent sand, 1 to 9 percent slopes
103	Valent sand, 9 to 20 percent slopes
104	Vona sandy loam, 1 to 3 percent slopes
105	Vona sandy loam, 3 to 9 percent slopes
106	Wigton loamy sand, 1 to 8 percent slopes
107	Wiley silt loam, 1 to 3 percent slopes
108	Wiley silt loam, 3 to 9 percent slopes
109	Yoder gravelly sandy loam, 1 to 8 percent slopes
110	Yoder gravelly sandy loam, 8 to 25 percent slopes

* Broadly defined units

CULTURAL FEATURES

BOUNDARIES

- National, state or province
- County or parish
- Minor civil division
- Reservation (national forest or park, state forest or park, and large airport)
- Land grant
- Limit of soil survey (label)
- Field sheet matchline & neatline

AD HOC BOUNDARY (label)

- Small airport, airfield, park, oilfield, cemetery, or flood pool (Davis Airstrip; FLOOD POOL LINE)

STATE COORDINATE TICK

LAND DIVISION CORNERS (sections and land grants)

ROADS

- Divided (median shown if scale permits)
- Other roads
- Trail

ROAD EMBLEMS & DESIGNATIONS

- Interstate (70)
- Federal (410)
- State (52)
- County, farm or ranch (378)

RAILROAD

POWER TRANSMISSION LINE (normally not shown)

PIPE LINE (normally not shown)

FENCE (normally not shown)

LEVEES

- Without road
- With road
- With railroad

DAMS

- Large (to scale)
- Medium or small (water; WD)

PITS

- Gravel pit (G.P.)
- Mine or quarry

MISCELLANEOUS CULTURAL FEATURES

- Farmstead, house (omit in urban areas)
- Church
- School
- Indian mound (label) (Indian Mound)
- Located object (label) (Tower)
- Tank (label) (GAS)
- Wells, oil or gas
- Windmill
- Kitchen midden

WATER FEATURES

DRAINAGE

- Perennial, double line
- Perennial, single line
- Intermittent
- Drainage end
- Canals or ditches
  - Double-line (label) (CANAL)
  - Drainage and/or irrigation

LAKES, PONDS AND RESERVOIRS

- Perennial (water; WD)
- Intermittent (int; I)

MISCELLANEOUS WATER FEATURES

- Marsh or swamp
- Spring
- Well, artesian
- Well, irrigation
- Wet spot

SPECIAL SYMBOLS FOR SOIL SURVEY

SOIL DELINEATIONS AND SYMBOLS (SvE 107)

ESCARPMENTS

- Bedrock (points down slope)
- Other than bedrock (points down slope)

SHORT STEEP SLOPE

GULLY

DEPRESSION OR SINK

SOIL SAMPLE SITE (normally not shown)

MISCELLANEOUS

- Blowout
- Clay spot
- Gravelly spot
- Gumbo, slick or scabby spot (sodic)
- Dumps and other similar non soil areas
- Prominent hill or peak
- Rock outcrop (includes sandstone and shale)
- Saline spot
- Sandy spot
- Severely eroded spot
- Slide or slip (tips point upslope)
- Stony spot, very stony spot

U. S. DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE

SHEET NO. 1
EL PASO COUNTY AREA, COLORADO
(MONUMENT QUADRANGLE)

R. 67 W. | R. 66 W.

DOUGLAS COUNTY

Monument

water

Cherry Creek

Black Squirrel Creek

Kettle Creek

Jackson Creek

Beaver Creek

Hay Creek

Monument Creek

Pring

FOREST

UNITED STATES AIR FORCE ACADEMY

ATCHISON, TOPEKA AND SANTA FE

DENVER AND RIO GRANDE

(Joins inset, sheet 30)

(Joins sheet 2)

(Joins sheet 8)

T 11 S
T. 12 S.

R. 67 W. | R. 66 W.

This soil survey map was compiled by the U.S. Department of Agriculture, Soil Conservation Service and cooperating agencies. Base maps are orthophotographs prepared by the U.S. Department of the Interior, Geological Survey, from 1974 and 1975 aerial photography. Coordinate grid ticks and land division corners, if shown, are approximately positioned.

1 ¾ ½ ¼ 0 1 2 Miles
5000 4000 3000 2000 1000 0 5000 10000 Feet
Scale 1:24000

EL PASO COUNTY AREA, COLORADO NO. 1

SHEET NO. 1 OF 37

U. S. DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE

SHEET NO. 2
EL PASO COUNTY AREA, COLORADO
(BLACK FOREST QUADRANGLE)

R. 66 W. | R. 65 W.

2 220 000 FEET

104° 37' 30"

39° 07' 30"

470 000 FEET

DOUGLAS COUNTY

ELBERT COUNTY

TABLE ROCK

SPRUCE HILL

BLACK FOREST

VOLLMER HILL

Elk Creek
Iron Gulch
Running Creek
Gulch
Neffs Gulch
Creek
Cherry Creek
East Kiowa
West Kiowa
Snipe Creek
Black Squirrel Creek
Kettle Creek
Burgess Creek

(Joins sheet 1)

(Joins sheet 3)

T. 11 S.
T. 12 S.

42

R. 66 W. | R. 65 W.

(Joins sheet 9)

2 240 000 FEET

39° 00' 00"

104° 45' 00"

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1 ½ ½ ½ 0 1 2 Miles

5000 4000 3000 2000 1000 0 5000 10000 Feet

Scale 1:24000

EL PASO COUNTY AREA, COLORADO NO. 2

R. 65 W. | R. 64 W.

ELBERT COUNTY

West Bijou Creek

Kiowa Creek

Kiowa Creek

Kiowa Creek

Kiowa Creek

Black Squirrel Creek

Black Squirrel Creek

Eastonville

RATTLESNAKE BUTTE

CHICAGO ROCK ISLAND AND PACIFIC

BLACK FOREST

Snipe Creek

(Joins sheet 2)

(Joins sheet 4)

T 11 S
T 12 S

R. 65 W. | R. 64 W.

(Joins sheet 10)

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1 ¾ ½ ¼ 0 1 2 Miles
5000 4000 3000 2000 1000 0 5000 10000 Feet
Scale 1:24000

U. S. DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE

SHEET NO. 4
EL PASO COUNTY AREA, COLORADO
(PEYTON QUADRANGLE)

R. 64 W. | R. 63 W.

R. 63 W. | R. 62 W.

104° 37' 30"

39° 07' 30"

2 290 000 FEET

470 000 FEET

ELBERT COUNTY

West Bijou Creek

Bijou Creek

Big Sandy Creek

Brackett Creek

Payton

CHICAGO ROCK ISLAND AND PACIFIC

PACIFIC AND CHICAGO ROCK ISLAND

(Joins sheet 3)

(Joins sheet 5)

T. 11 S.
T. 12 S.

(Joins sheet 11)

2 310 000 FEET

420 000 FEET

39° 00' 00"

104° 30' 00"

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1 ¾ ½ ¼ 0 1 2 Miles
5000 4000 3000 2000 1000 0 5000 10000 Feet
Scale 1:24000

EL PASO COUNTY AREA, COLORADO NO. 4

ELBERT COUNTY

R. 62 W. | R. 61 W.

T. 10 S.
T. 11 S.

Antelope Creek

Big Sandy Creek

intermittent

intermittent

Chicago Rock Island and Pacific

Chicago Rock Island and Pacific

Calhan

Bracket East Creek

(Joins sheet 4)

(Joins sheet 6)

(Joins sheet 12)

T. 11 S.
T. 12 S.

R. 62 W. | R. 61 W.

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Scale 1:24000

R. 61 W. | R. 60 W.

104° 07'30"

39° 07'30"

ELBERT COUNTY

Ramah

Antelope Creek

Sandy Creek

Big Sandy Creek

RAMAH RESERVOIR

CHICAGO ROCK ISLAND AND PACIFIC

Mustang Creek

North Fork Horse Creek

int

(Joins sheet 5)

(Joins sheet 7)

T. 11 S.
T. 12 S.

(Joins sheet T3)

104° 15'00"

39° 00'00"

2 460 000 FEET

2 420 000 FEET

2 390 000 FEET

R. 61 W. R. 60 W.

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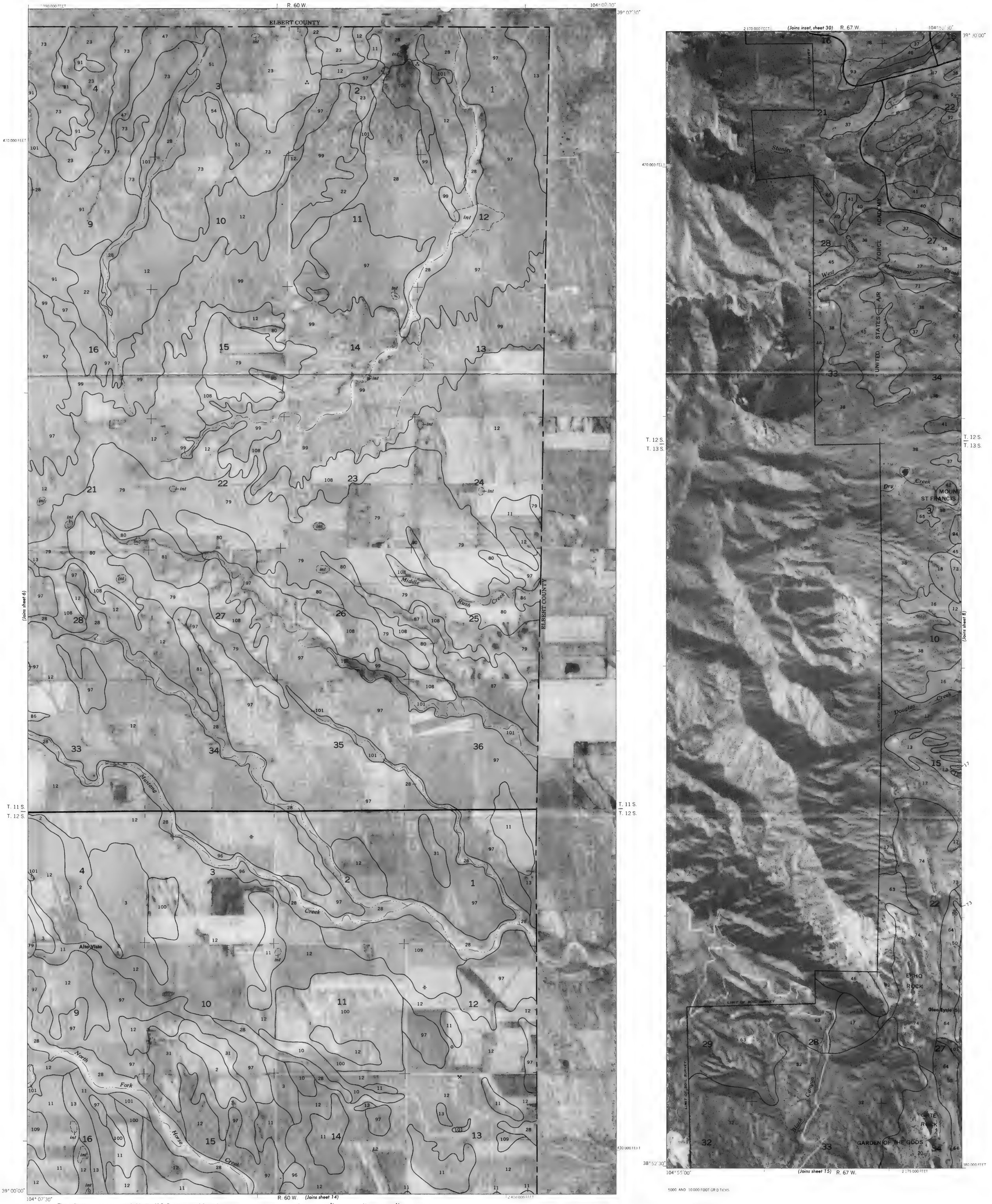
1 ½ ½ ½ 0 1 2 Miles
5000 4000 3000 2000 1000 0 5000 10000 Feet
Scale 1:24000



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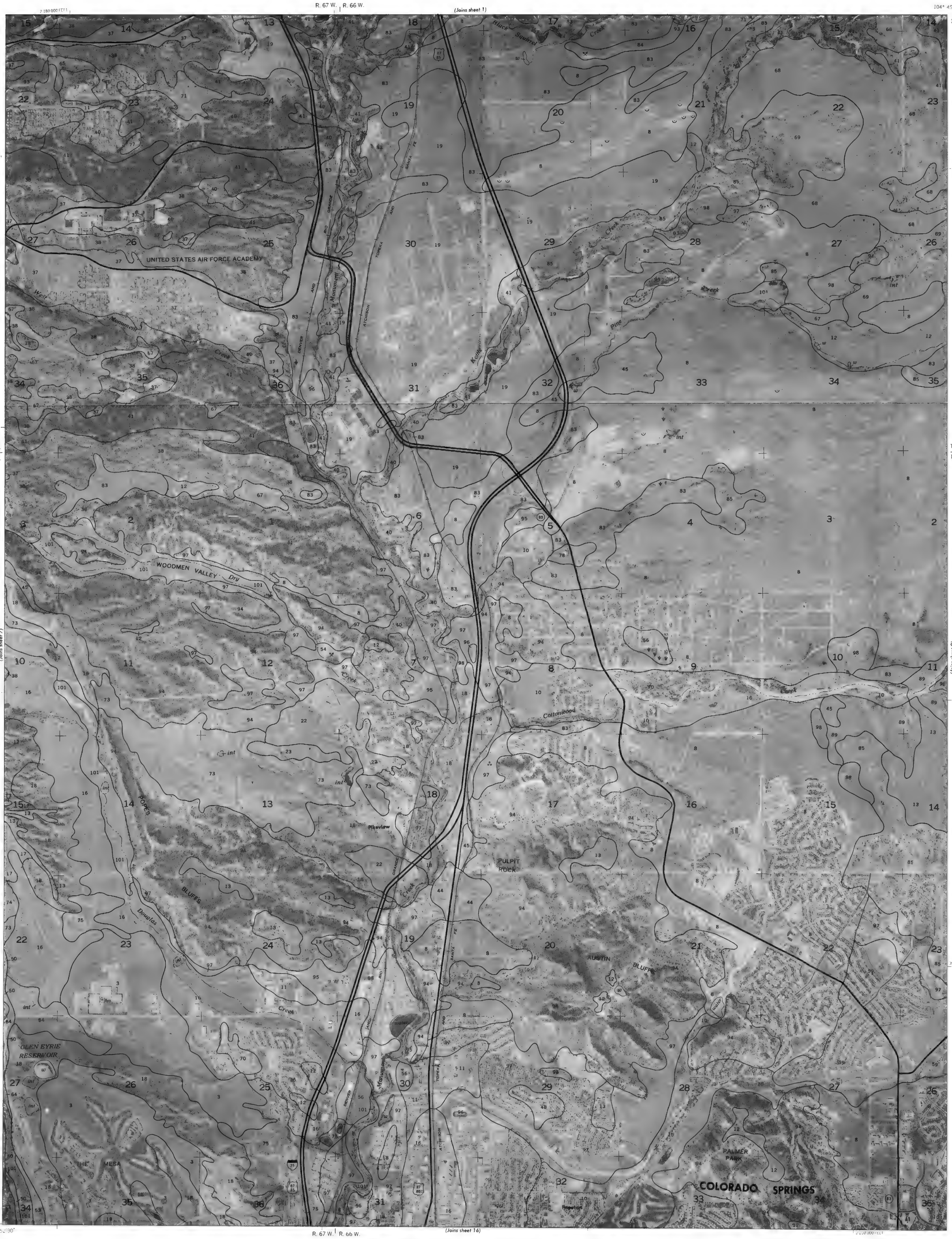
1 ¾ ½ ¼ 0 1 2 Miles
5000 4000 3000 2000 1000 0 5000 10 000 Feet
Scale 1:24000



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1 ¾ ½ ¼ 0 1 2 Miles
5000 4000 3000 2000 1000 0 5000 10000 Feet
Scale 1:24000

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1 ¾ ½ ¼ 0 1 2 Miles
5000 4000 3000 2000 1000 0 5000 10 000 Feet
Scale 1:24000

EL PASO COUNTY AREA, COLORADO NO. 9

R. 65 W. | R. 64 W.

(Joins sheet 3)

104° 30'00"

39° 00'00"

T. 12 S.
T. 13 S.

(Joins sheet 9)

(Joins sheet 11)

(Joins sheet 18)

38°52'30"

104° 37'30"

Falcon

Black Squirrel Creek

Camp Creek

Jimmy

CHICAGO ROCK ISLAND AND PACIFIC

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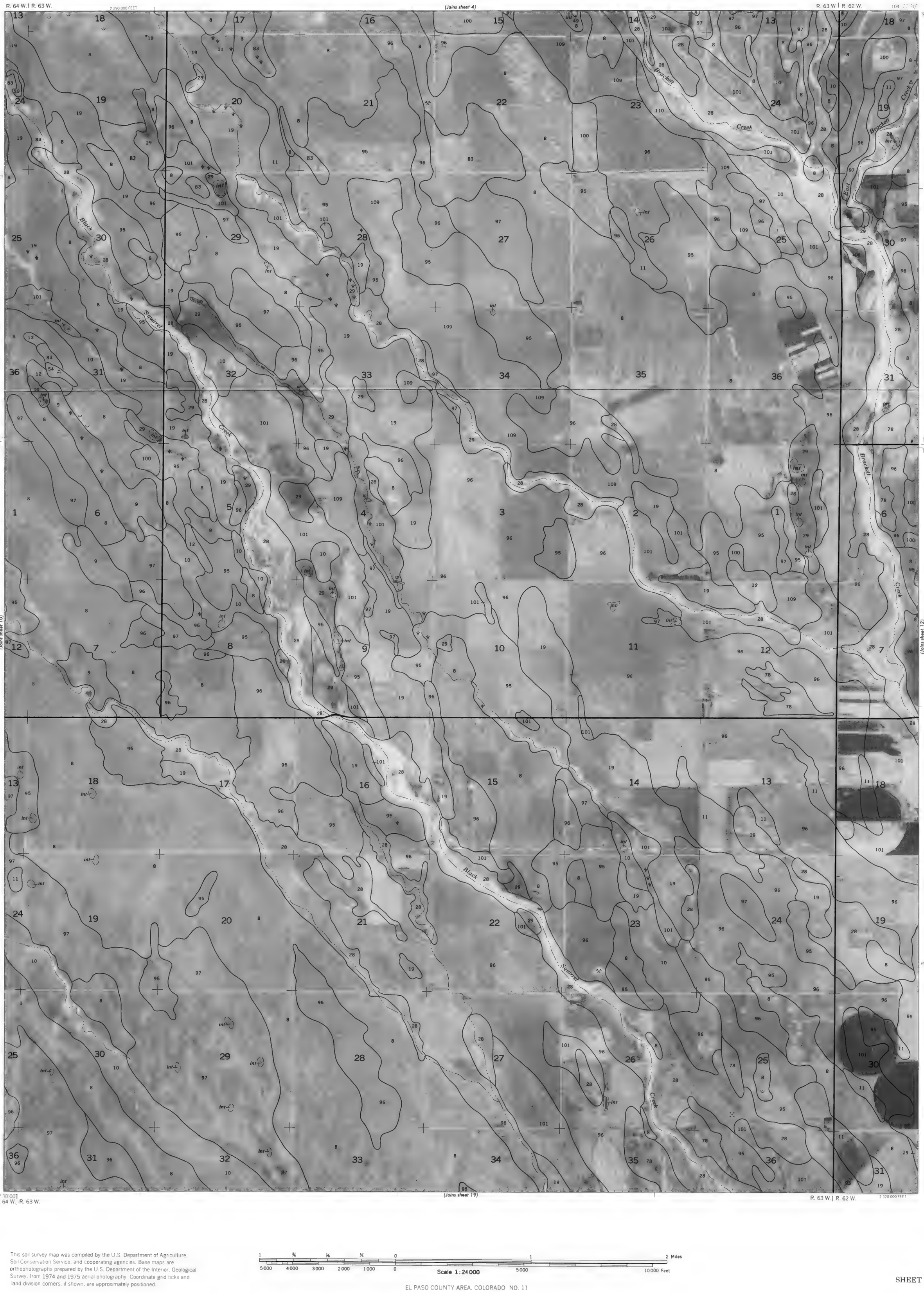
1 ¾ ½ ¼ 0 1 2 Miles
5000 4000 3000 2000 1000 0 5000 10000 Feet
Scale 1:24000



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1 ¾ ½ ¼ 0 1 2 Miles
5000 4000 3000 2000 1000 0 5000 10000 Feet
Scale 1:24000

EL PASO COUNTY AREA, COLORADO NO. 11

U. S. DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE

SHEET NO. 12
EL PASO COUNTY AREA, COLORADO
(HOLCOLM HILLS QUADRANGLE)

2 320 000 FEET — R. 62 W. | R. 61 W. — 104°15'00" — 39° 00'00"

(Joins sheet 5)

420 000 FEET

T. 12 S.
T. 13 S.

HOLCOLM

HILLS

Bracket Creek

East Fork

Horse Creek

Steele Fork

Bracket Creek

int

(Joins sheet 11)

(Joins sheet 13)

38°52'30" — 104°22'30" — (Joins sheet 20) — R. 62 W. | R. 61 W. — 2 350 000 FEET

390 000 FEET

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1 ¾ ½ ¼ 0 1 2 Miles
5000 4000 3000 2000 1000 0 5000 10000 Feet
Scale 1:24000

EL PASO COUNTY AREA, COLORADO NO. 12

U. S. DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE

SHEET NO. 13
EL PASO COUNTY AREA, COLORADO
(RUSH NW QUADRANGLE)

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1 ¾ ½ ¼ 0 1 2 Miles
5000 4000 3000 2000 1000 0 5000 10000 Feet
Scale 1:24000

EL PASO COUNTY AREA, COLORADO NO. 13

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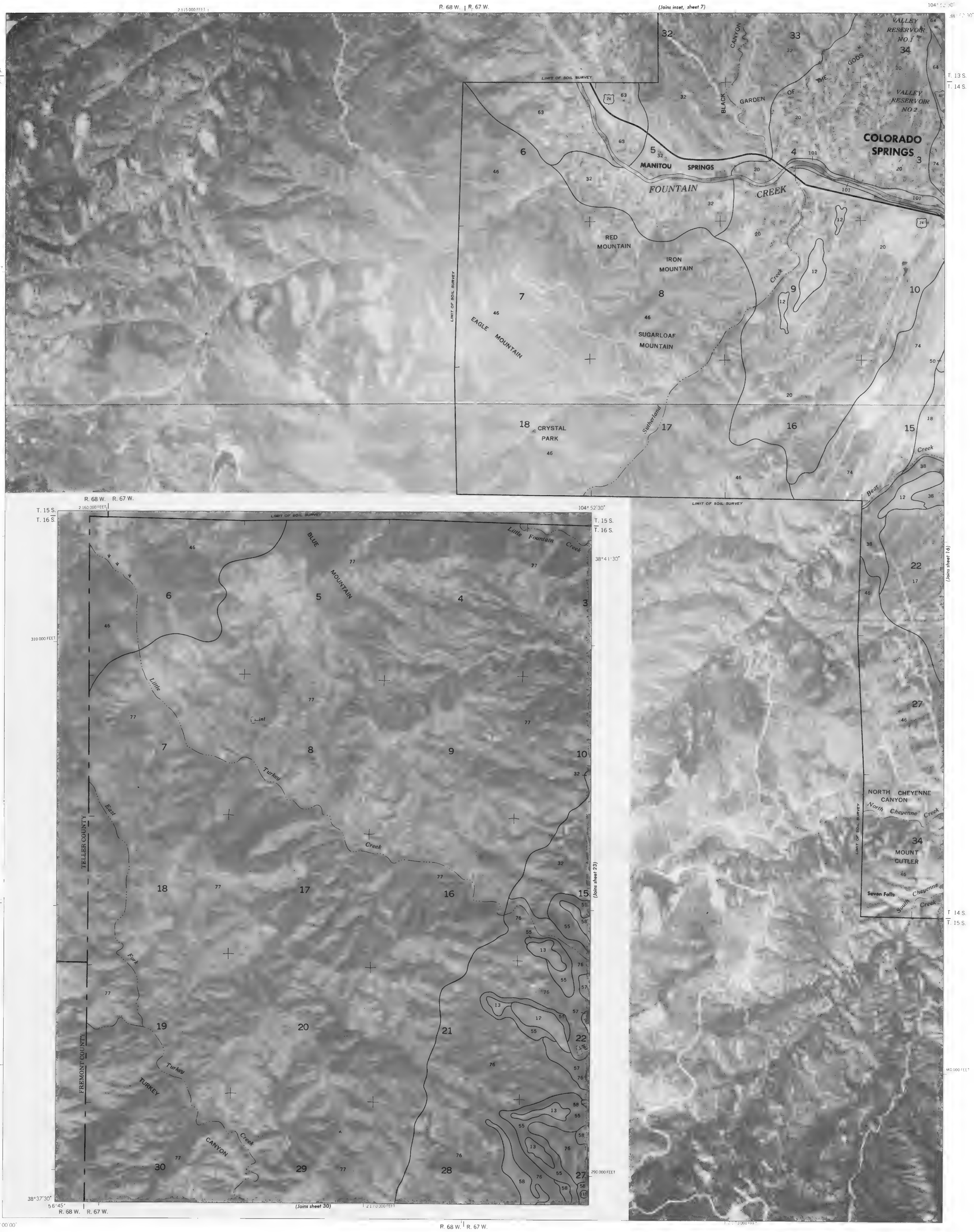
1 ⅞ ¾ ½ 0 1 2 Miles
5000 4000 3000 2000 1000 0 5000 10000 Feet
Scale 1:24000

EL PASO COUNTY AREA, COLORADO NO. 14



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1 ¾ ½ ¼ 0 1 2 Miles
5000 4000 3000 2000 1000 0 5000 10000 Feet
Scale 1:24000

R. 67 W. | R. 66 W.

(Joins sheet 8)

104°45'00"

T. 13 S.
T. 14 S.

COLORADO SPRINGS

PALMER PARK

THE MESA

VALLEY RESERVOIR NO. 1

VALLEY RESERVOIR NO. 2

HIGHLINE RESERVOIR

MESA RESERVOIR NO. 1

MESA RESERVOIR NO. 2

FOUNTAIN CREEK

Bear Creek

MEMORIAL PARK

PROSPECT LAKE

water

Ivywild

Stratton Meadows

Broadmoor

POINT SUBLIME

MESA RESERVOIR

NORTH CHEYENNE CANYON

South Cheyenne Creek

BIG STRATTON RESERVOIR

STRATMOOR HILLS

Kelker

Knob Hill

Security

Skinners

FORT CARSON MILITARY RESERVATION

CHEYENNE MOUNTAIN

THE HORNS

LIMIT OF SOIL SURVEY

(Joins sheet 15)

(Joins sheet 17)

T. 14 S.
T. 15 S.

104°52'30"

R. 67 W. | R. 66 W.

(Joins sheet 23)

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1 ¾ ½ ¼ 0 1 2 Miles
5000 4000 3000 2000 1000 0 5000 10000 Feet
Scale 1:24000

EL PASO COUNTY AREA, COLORADO NO. 16

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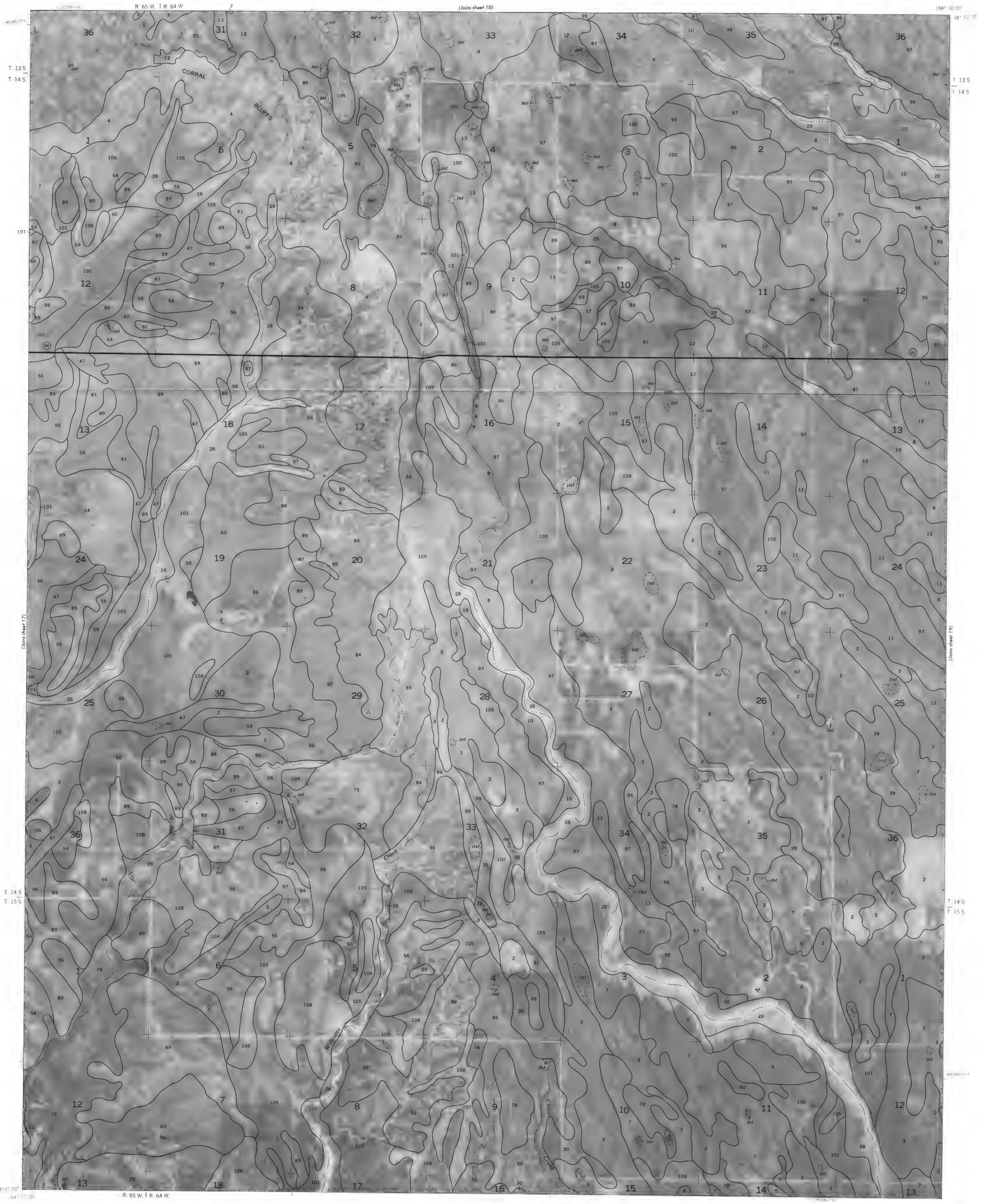
1 ¾ ½ ¼ 0 1 2 Miles
5000 4000 3000 2000 1000 0 5000 10000 Feet
Scale 1:24000

EL PASO COUNTY AREA, COLORADO NO. 17



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1 ½ ½ ½ 0 1 2 Miles
5000 4000 3000 2000 1000 0 5000 10000 Feet
Scale 1:24000

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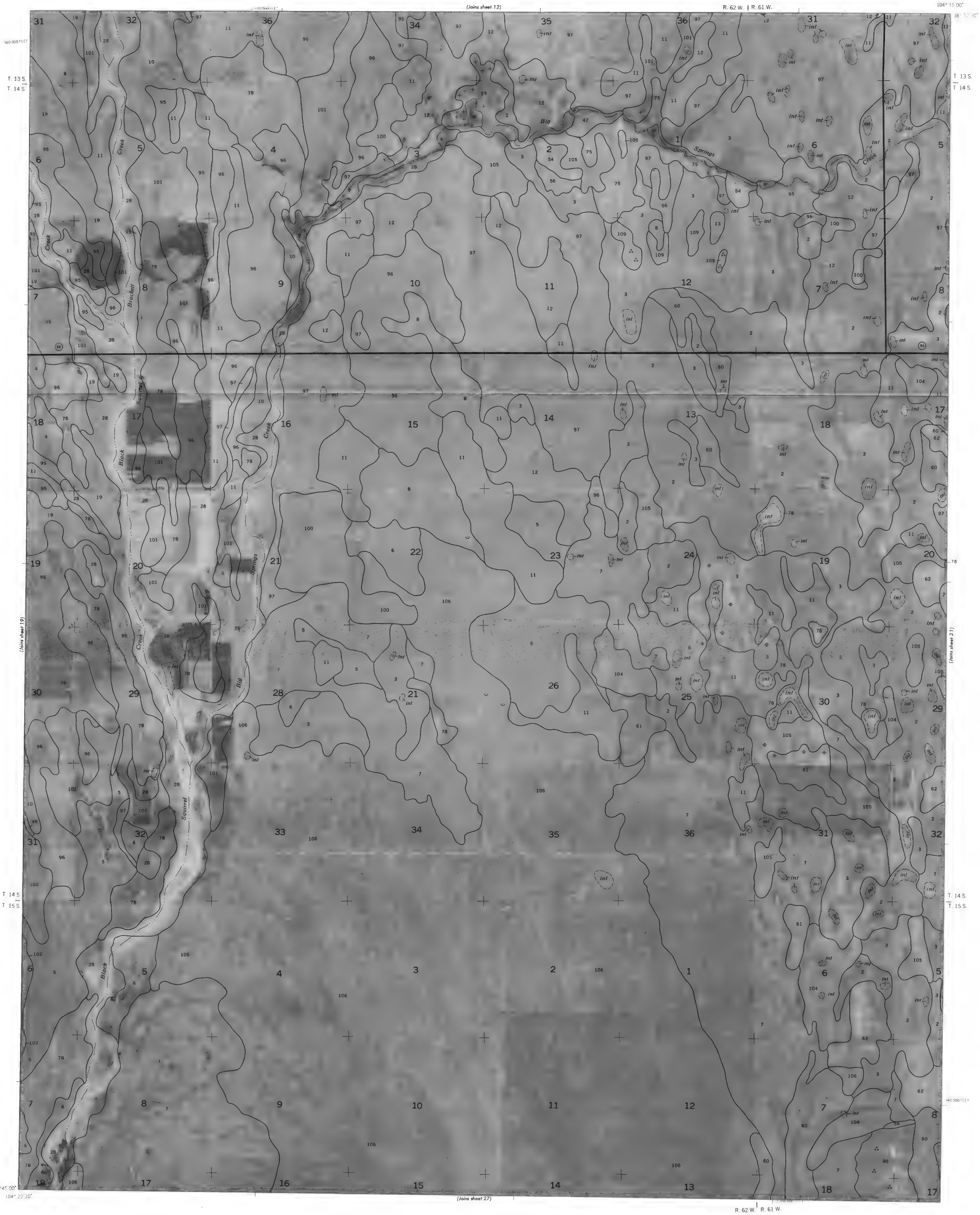
1 ⅞ ¾ ⅝ 0 1 2 Miles
5000 4000 3000 2000 1000 0 5000 10 000 Feet
Scale 1:24000

EL PASO COUNTY AREA, COLORADO NO. 19



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1 ¾ ½ ¼ 0 1 2 Miles
5000 4000 3000 2000 1000 0 5000 10 000 Feet
Scale 1:24000

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1 ⅝ ½ ⅜ 0 1 2 Miles
5000 4000 3000 2000 1000 0 5000 10000 Feet
Scale 1:24000

EL PASO COUNTY AREA, COLORADO NO 21

R. 60 W.

(Joins sheet 14)

104° 00' 00"

38° 52' 30"

T. 13 S.
T. 14 S.

ELBERT COUNTY

LINCOLN COUNTY

Steels Fork

Rush

Pond Creek

(Joins sheet 21)

(Joins sheet 29)

38° 45' 00"

104° 0' 0"

R. 60 W.

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1 ½ ½ ½ 0 1 2 Miles
5000 4000 3000 2000 1000 0 5000 10000 Feet
Scale 1:24000

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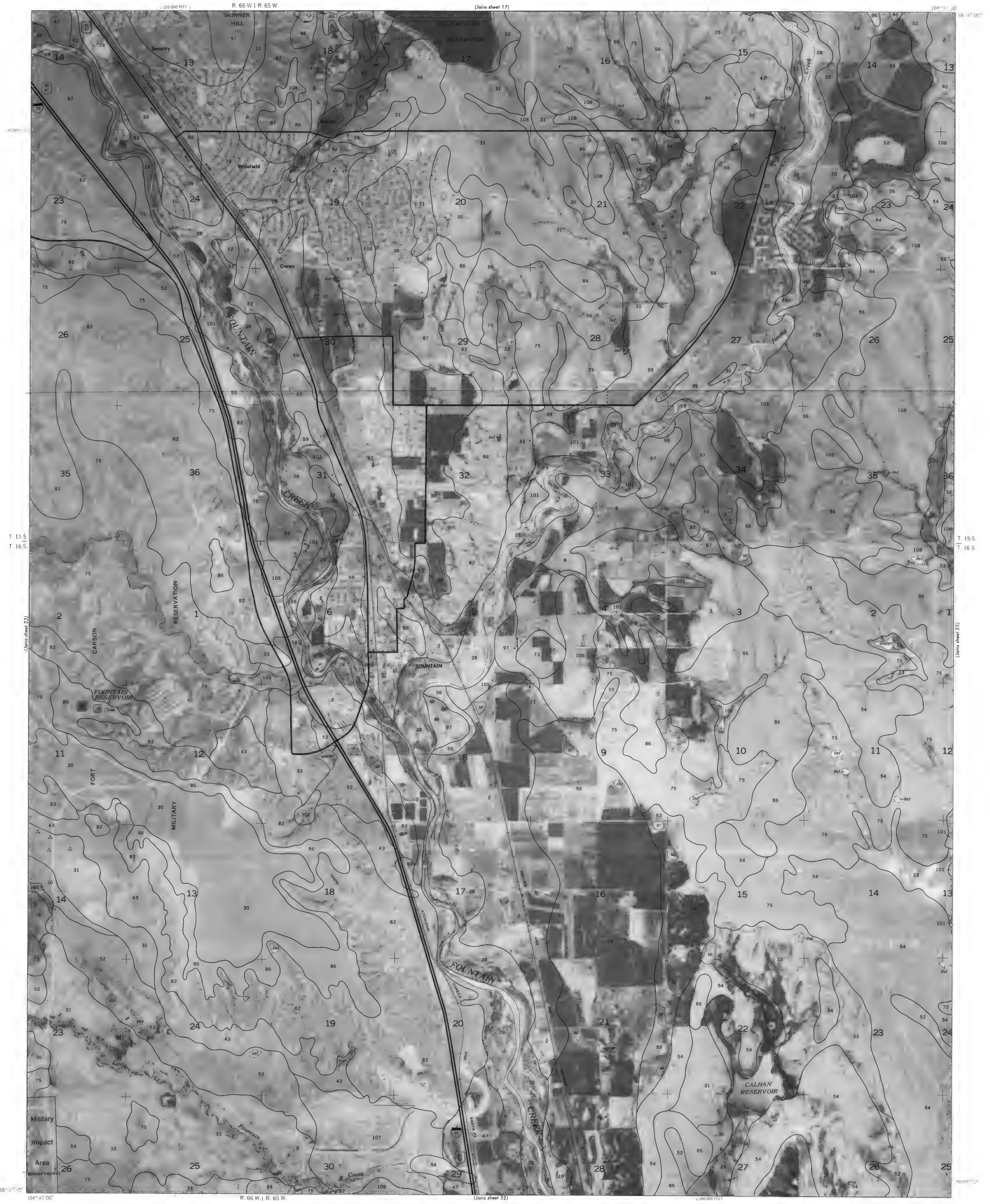
1 ¾ ½ ¼ 0 1 2 Miles
5000 4000 3000 2000 1000 0 Scale 1:24000 5000 10000 Feet

EL PASO COUNTY AREA, COLORADO NO. 23



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Scale 1:24000

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1 ¾ ½ ¼ 0 1 2 Miles
5000 4000 3000 2000 1000 0 5000 10000 Feet
Scale 1:24000

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1 ⅝ ½ ⅛ 0 1 2 Miles
5000 4000 3000 2000 1000 0 Scale 1:24000 5000 10000 Feet

EL PASO COUNTY AREA, COLORADO NO. 26

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1 ⅝ ½ ⅛ 0 1 2 Miles
5000 4000 3000 2000 1000 0 5000 10000 Feet
Scale 1:24000

EL PASO COUNTY AREA, COLORADO NO. 27

2 360 000 FEET

(Joins sheet 21)

R. 61 W. | R. 60 W.

104° 07'30"

38° 45'00"

330 000 FEET

Truckton

SIGNAL ROCK

T. 15 S.
T. 16 S.

(Joins sheet 27)

(Joins sheet 29)

300 000 FEET

38° 37'30"

104° 15'00"

(Joins sheet 36)

R. 61 W. | R. 60 W.

2 390 000 FEET

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1 ¾ ½ ¼ 0 1 2 Miles
5000 4000 3000 2000 1000 0 5000 10000 Feet
Scale 1:24000

EL PASO COUNTY AREA, COLORADO NO. 28

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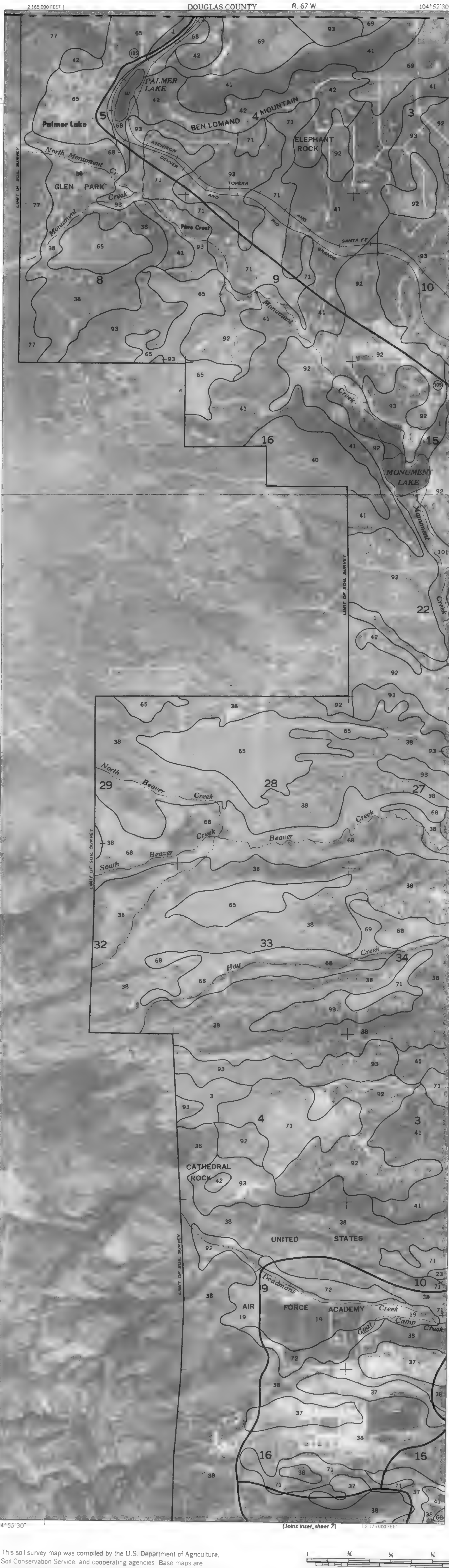
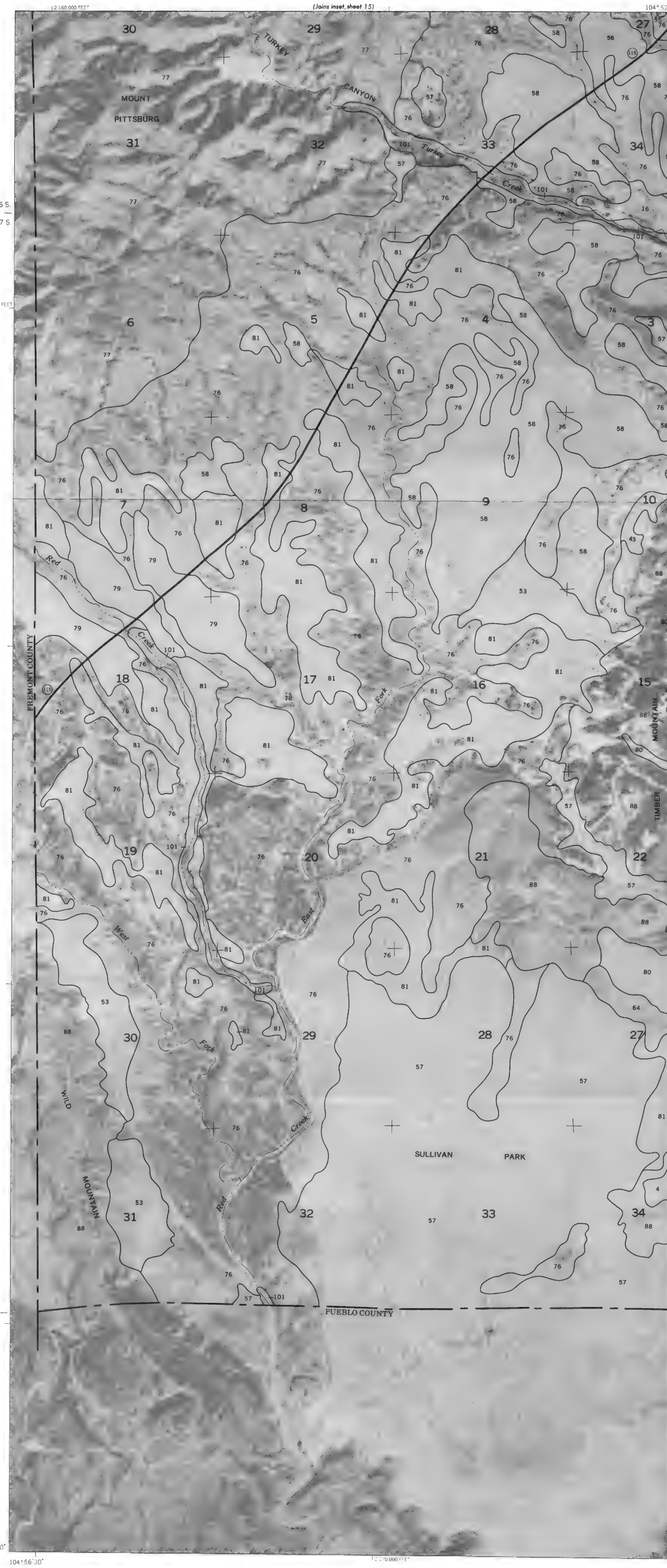
1 ¾ ½ ¼ 0 1 2 Miles
5000 4000 3000 2000 1000 0 Scale 1:24000 5000 10000 Feet





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1 ¾ ½ ¼ 0 1 2 Miles
5000 4000 3000 2000 1000 0 5000 10000 Feet
Scale 1:24000

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1 ⅝ ½ ⅜ 0 1 2 Miles
5000 4000 3000 2000 1000 0 5000 10000 Feet
Scale 1:24000

EL PASO COUNTY AREA, COLORADO NO. 31

U. S. DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE

SHEET NO. 32
EL PASO COUNTY AREA, COLORADO
(BUTTES QUADRANGLE)

2 220 000 FEET

R. 66 W. | R. 65 W.

(Joins sheet 24)

104° 37'30"

38° 37'30"

T. 16 S.
T. 17 S.

2 280 000 FEET

Military Impact Area
(Unsurveyed)

Military Impact Area
(Unsurveyed)

Military Impact Area
(Unsurveyed)

Little Fountain Creek

ATCHISON TOPEKA AND SANTA FE

DENVER & RIO GRANDE

Buttes

FOUNTAIN CREEK

Williams Creek

Fountain Creek

(Joins sheet 31)

(Joins sheet 33)

T. 17 S.
T. 18 S.

PUEBLO COUNTY

R. 66 W. | R. 65 W.

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1 ¾ ½ ¼ 0 1 2 Miles
5000 4000 3000 2000 1000 0 5000 10 000 Feet
Scale 1:24000

EL PASO COUNTY AREA, COLORADO NO. 32

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1 ⅝ ½ ⅜ 0 1 2 Miles
5000 4000 3000 2000 1000 0 5000 10 000 Feet
Scale 1:24000

R. 64 W. | R. 63 W. — 2 290 000 FEET — (Joins sheet 26) — R. 63 W. | R. 62 W. — 104° 22'30"

38° 37'30"

T. 16 S.
T. 17 S.

280 000 FEET

(Joins sheet 33)

(Joins sheet 35)

Chico Creek

PUEBLO COUNTY

250 000 FEET

38° 30'00"

R. 64 W. | R. 63 W. — 104° 30'00" — R. 63 W. | R. 62 W. — 2 320 000 FEET

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1 ¾ ½ ¼ 0 1 2 Miles
5000 4000 3000 2000 1000 0 5000 10000 Feet
Scale 1:24000

2 330 000 FEET | (Joins sheet 27) | R. 62 W. | R. 61 W. | 104°15'00"

290 000 FEET

38°37'30"

T. 16 S.
T. 17 S.

Squirrel Creek

Black Squirrel Creek

(Joins sheet 34)

(Joins sheet 36)

PUEBLO COUNTY

38°30'00"

104°22'30"

2 350 000 FEET

250 000 FEET

R. 62 W. R. 61 W.

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1 ¾ ½ ¼ 0 1 2 Miles
5000 4000 3000 2000 1000 0 5000 10000 Feet
Scale 1:24000

EL PASO COUNTY AREA, COLORADO NO. 35

2 360 000 FEET | (Joins sheet 28) | R. 61 W. | R. 60 W. | 104° 07'30"

290 000 FEET

38° 37'30"

T. 16 S.
T. 17 S.

(Joins sheet 35)

(Joins sheet 37)

PUEBLO COUNTY

250 000 FEET

38° 30'00"

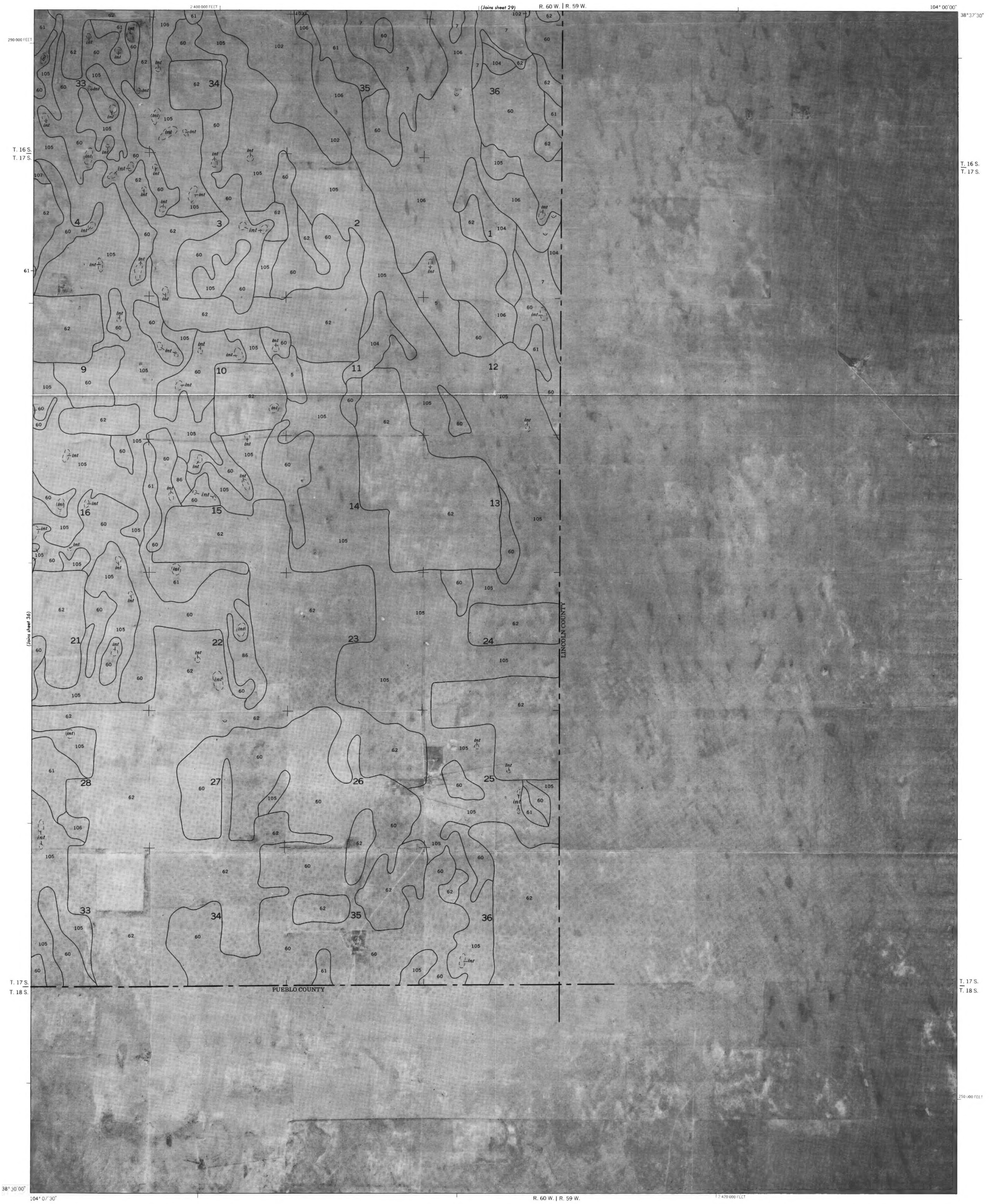
104° 15'00"

2 390 000 FEET

This soil survey map was compiled by the U.S. Department of Agriculture, Soil Conservation Service, and cooperating agencies. Base maps are orthophotographs prepared by the U.S. Department of the Interior, Geological Survey, from 1974 and 1975 aerial photography. Coordinate grid ticks and land division corners, if shown, are approximately positioned.

1 ¾ ½ ¼ 0 1 2 Miles
5000 4000 3000 2000 1000 0 5000 10000 Feet
Scale 1:24000

EL PASO COUNTY AREA, COLORADO NO. 36



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1 ¾ ½ ¼ 0 1 2 Miles
5000 4000 3000 2000 1000 0 5000 10000 Feet
Scale 1:24000

EL PASO COUNTY AREA, COLORADO NO 37